# Chapter 2

## Current Emissions and Air Quality -- Criteria Pollutants

# *Introduction*

This chapter provides statewide information on current emissions and air quality, relative to the State and national ambient air quality standards (see Chapter 5 for information on toxic air contaminants). This section gives a national perspective on how California's air quality compares with that in other areas of the nation. The second section of this chapter includes a summary table of the Statewide Emission Inventory. The table shows emissions data by three major source categories: stationary sources, area-wide sources, and mobile sources. Emissions data for natural sources is provided in Appendix E. The remaining sections of this Chapter provide information on emissions (including the high emitting facilities) and air quality on a statewide basis. This information is organized by pollutant, for ozone (and ozone precursor emissions), particulate matter ($PM_{10}$ and $PM_{2.5}$), CO, and ammonia ($NH_3$).

Emissions are reported as annual averages, in tons per day. For most sources and pollutants that are not seasonal, this describes emissions very well. However, for some pollutants such as $PM_{10}$ and $PM_{2.5}$, annual averages do not give an accurate indication of the seasonal nature of emissions. Therefore, they may appear to be artificially low. Many sources of $PM_{10}$ and $PM_{2.5}$ are seasonal, including wildfires, agricultural processes, residential wood combustion, or dust storms in the Owens Valley and Mono Lake areas. Many sources of $PM_{10}$ and $PM_{2.5}$ can also be very localized, and basinwide annual averages do not give any information about these sources.

State and local agencies have implemented many control measures during the last three decades to improve air quality. As a result, there has been a steady decline in both emissions and pollutant concentrations. However, two criteria pollutants, ozone and particulate matter, still pose air quality problems. Significant progress has been made towards attainment of CO standards. With the exception of the City of Calexico in Imperial County, both the national and State CO standards have been attained statewide. Although substantial progress has been made in reducing ozone and PM levels, it will be a challenge to reduce emissions sufficiently to attain these standards statewide.

Figure 2-1 shows the national 1-hour ozone design values for the top 15 urban areas in the nation, based on data for 2000 to 2002. The design values in all these areas exceed the national 1-hour standard of 0.12 ppm. Five of the top 15 areas are located in California, with

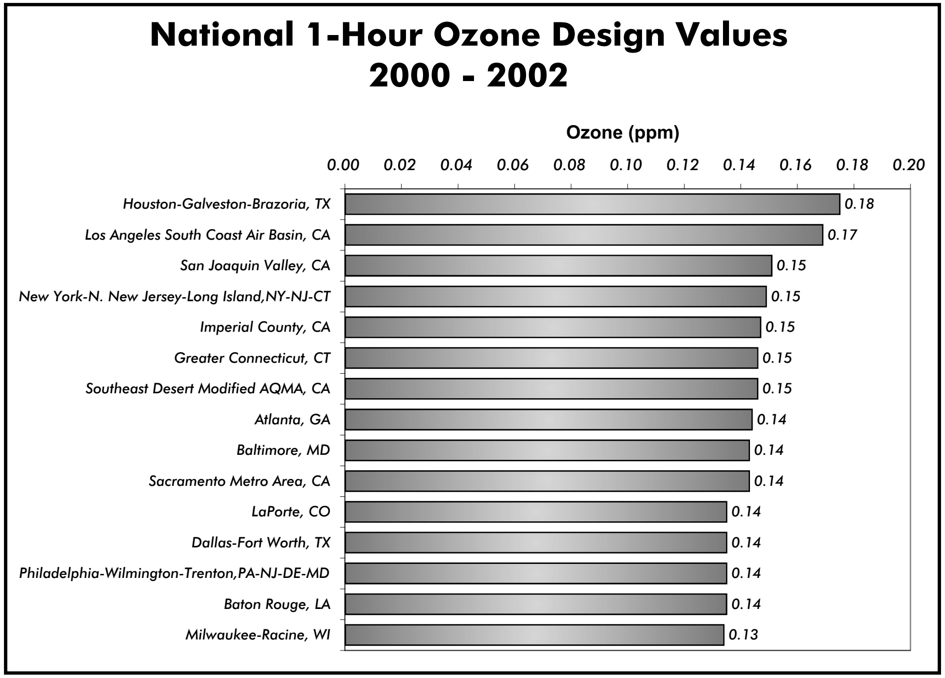


Figure 2-1

the Los Angeles South Coast Air Basin and San Joaquin Valley areas ranking second and third. Unlike previous years, the top spot is not held by a California area. However, the ranking of areas can change, depending on the ozone statistic used. For example, based on the average estimated exceedance rate during 2000 to 2002, the San Joaquin Valley area would rank first (16.9 days) while the Houston-Galveston-Brazoria, Texas area would rank fourth (5.4 days.) Overall, as ozone concentrations in California decline, our air quality continues to improve relative to other areas of the nation.

Attainment of the standards for particulate matter ($PM_{10}$ and $PM_{2.5}$) is also a significant problem. The $PM_{10}$ problem is most prevalent in the western United States. Eight western areas are classified as serious $PM_{10}$ nonattainment areas. Half of these, the Coachella Valley, the Owens Valley, the San Joaquin Valley, and the South Coast Air Basin, are located in California. In contrast, the $PM_{2.5}$ problem is prevalent in both the eastern United States and in California. Because of the complex nature of the PM problem, it will be many years before the standards are attained.

Carbon monoxide poses much less of a problem than PM. Figure 2-2 shows the four areas in the nation that averaged at least one day with CO concentrations above the level of the national standard during 2000 to 2002. The Calexico (Imperial County) area ranked second. Calexico is the only area in California where the national CO standard is still violated. However, the Calexico area has made considerable progress towards attainment. Peak levels have declined significantly in the last five years, as have the number of days that the standard is exceeded. The State's stringent motor vehicle emission standards and clean fuels programs continue to be effective in reducing ambient CO concentrations. Furthermore, as a result of these controls, CO concentrations in nine other California areas no longer violate the national standards, and these areas have been redesignated as attainment.

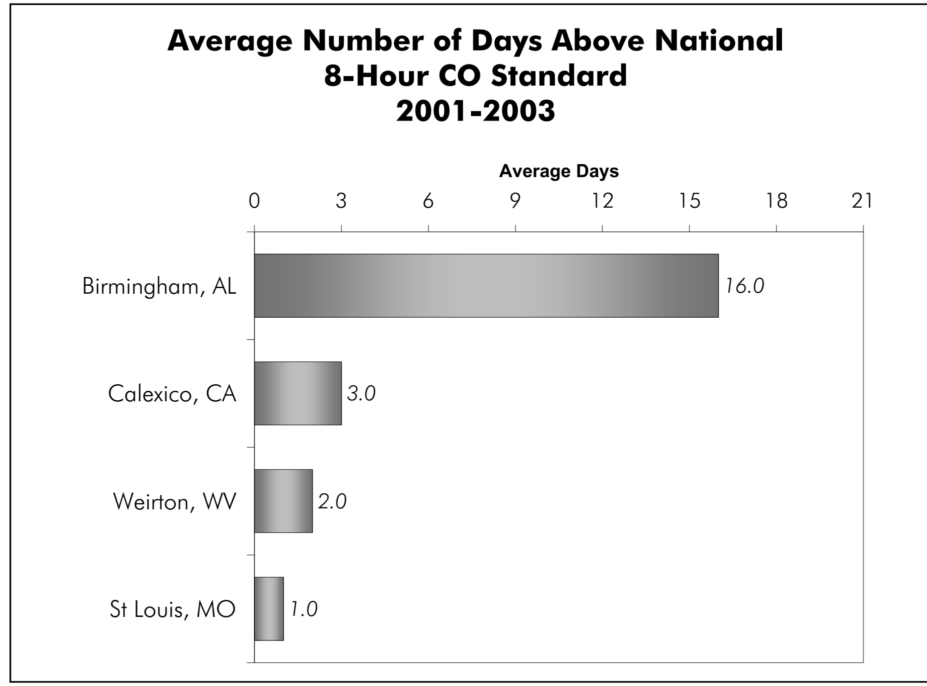

Figure 2-2

# 2004 Statewide Emission Inventory Summary

| Division<br>Major Category | Emissions (tons/day, annual average)<br>ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
|---|---|---|---|---|---|---|---|
| **Stationary Sources** | **505** | **405** | **506** | **134** | **131** | **86** | **49** |
| Fuel Combustion | 45 | 341 | 395 | 41 | 41 | 36 | 2 |
| Waste Disposal | 22 | 2 | 3 | 0 | 1 | 1 | 44 |
| Cleaning And Surface Coatings | 222 | 1 | 0 | 0 | 0 | 0 | - |
| Petroleum Production And Marketing | 155 | 10 | 11 | 62 | 2 | 2 | - |
| Industrial Processes | 61 | 51 | 97 | 31 | 87 | 47 | 4 |
| **Area-Wide Sources** | **707** | **2138** | **93** | **5** | **1835** | **582** | **341** |
| Solvent Evaporation | 449 | - | - | - | 0 | 0 | 30 |
| Miscellaneous Processes | 258 | 2138 | 93 | 5 | 1835 | 582 | 311 |
| **Mobile Sources** | **1299** | **11259** | **2527** | **74** | **119** | **97** | **103** |
| On-Road Motor Vehicles | 824 | 8172 | 1589 | 12 | 49 | 34 | 103 |
| Other Mobile Sources | **476** | **3087** | **938** | **62** | **70** | **63** | **0** |
| ***Total Statewide - All Sources*** | ***2512*** | ***13802*** | ***3126*** | ***213*** | ***2086*** | ***765*** | ***493*** |

* Includes directly emitted particulate matter only.
** Natural sources are provided in Appendix E. These summaries do not include emissions from wind blown dust - exposed lake beds from Owens and Mono Lakes. These emissions are estimated to be about 131 tons/day of $PM_{10}$.
Table 2-1

# 2004 Statewide Emission Inventory by Sub-Category

| Division / Major Category / Sub-Category | ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
|---|---|---|---|---|---|---|---|
| | Emissions (tons/day, annual average) | | | | | | |
| **Stationary Sources (division total)** | 505 | 405 | 506 | 134 | 131 | 86 | 49 |
| Fuel Combustion (major category total) | 45 | 341 | 395 | 41 | 41 | 36 | 2 |
| - Electric Utilities | 5 | 77 | 31 | 3 | 8 | 8 | 1 |
| - Cogeneration | 6 | 47 | 31 | 2 | 4 | 4 | 0 |
| - Oil And Gas Production (Combustion) | 8 | 24 | 35 | 3 | 2 | 2 | 0 |
| - Petroleum Refining (Combustion) | 2 | 17 | 35 | 13 | 3 | 3 | - |
| - Manufacturing And Industrial | 9 | 70 | 132 | 14 | 8 | 7 | 1 |
| - Food And Agricultural Processing | 5 | 55 | 35 | 3 | 3 | 3 | - |
| - Service And Commercial | 9 | 32 | 70 | 3 | 5 | 5 | - |
| - Other (Fuel Combustion) | 2 | 20 | 26 | 1 | 8 | 4 | - |
| Waste Disposal (major category total) | 22 | 2 | 3 | 0 | 1 | 1 | 44 |
| - Sewage Treatment | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| - Landfills | 17 | 1 | 1 | 0 | 0 | 0 | 11 |
| - Incinerators | 0 | 1 | 1 | 0 | 0 | 0 | - |
| - Soil Remediation | 0 | - | 0 | - | 0 | 0 | - |
| - Other (Waste Disposal) | 4 | 0 | 0 | - | 0 | 0 | 32 |
| Cleaning And Surface Coatings (major category total) | 222 | 1 | 0 | 0 | 0 | 0 | - |
| - Laundering | 1 | 0 | 0 | - | - | - | - |
| - Degreasing | 47 | - | - | - | - | - | - |
| - Coatings And Related Process Solvents (sub-category total) | 130 | 0 | 0 | 0 | 0 | 0 | - |
| *- Auto Marine, & Aircraft* | *22* | *0* | *0* | *0* | *0* | *0* | - |
| *- Paper & Fabric* | *3* | *0* | *0* | *0* | *0* | *0* | - |
| *- Metal, Wood, & Plastic* | *34* | *0* | *0* | *0* | *0* | *0* | - |
| *- Other* | *70* | *0* | *0* | *0* | *0* | *0* | - |

* Includes directly emitted particulate matter only.

Table 2-2

# 2004 Statewide Emission Inventory by Sub-Category

| Division<br>Major Category<br>Sub-Category | Emissions (tons/day, annual average) ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
|---|---|---|---|---|---|---|---|
| **Stationary Sources (division total) (continued)** | | | | | | | |
| Cleaning And Surface Coatings (major category) (continued) | | | | | | | |
| - Printing | 18 | 1 | 0 | - | 0 | 0 | - |
| - Adhesives And Sealants | 20 | - | - | - | - | - | - |
| - Other (Cleaning And Surface Coatings) | 6 | - | 0 | - | 0 | 0 | - |
| Petroleum Production And Marketing (major category total) | 155 | 10 | 11 | 62 | 2 | 2 | - |
| - Oil And Gas Production | 49 | 1 | 3 | 0 | 0 | 0 | - |
| - Petroleum Refining | 22 | 8 | 8 | 62 | 2 | 2 | - |
| - Petroleum Marketing (sub-category total) | 84 | 0 | 0 | - | 0 | 0 | - |
| *- Fuel Distribution Losses* | *4* | *0* | *0* | *0* | *0* | *0* | - |
| *- Fuel Storage Losses* | *3* | *0* | *0* | *0* | *0* | *0* | - |
| *- Vehicle Refueling* | *50* | *0* | *0* | *0* | *0* | *0* | - |
| *- Other* | *26* | *0* | *0* | *0* | *0* | *0* | - |
| - Other (Petroleum Production And Marketing) | 0 | - | - | - | - | - | - |
| Industrial Processes (major category total) | 61 | 51 | 97 | 31 | 87 | 47 | 4 |
| - Chemical | 20 | 1 | 2 | 4 | 4 | 4 | 0 |
| - Food And Agriculture | 20 | 3 | 9 | 1 | 15 | 7 | - |
| - Mineral Processes | 4 | 39 | 63 | 20 | 46 | 21 | 0 |
| - Metal Processes | 2 | 2 | 1 | 0 | 1 | 1 | - |
| - Wood And Paper | 3 | 1 | 2 | 0 | 9 | 6 | - |
| - Glass And Related Products | 0 | 0 | 12 | 5 | 2 | 2 | - |
| - Electronics | 1 | 0 | 0 | - | 0 | 0 | - |
| - Other (Industrial Processes) | 11 | 5 | 7 | 1 | 9 | 7 | 4 |

* Includes directly emitted particulate matter only.

Table 2-2 (continued)

# 2004 Statewide Emission Inventory by Sub-Category

| Division / Major Category / Sub-Category | ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
|---|---|---|---|---|---|---|---|
| | Emissions (tons/day, annual average) | | | | | | |
| **Area-Wide Sources (division total)** | 707 | 2138 | 93 | 5 | 1835 | 582 | 341 |
| Solvent Evaporation (major category total) | 449 | - | - | - | 0 | 0 | 30 |
| - Consumer Products | 253 | - | - | - | - | - | - |
| - Architectural Coatings And Related Process Solvent (sub-category total) | 109 | - | - | - | - | - | - |
| *- Architectural Coatings* | *93* | *0* | *0* | *0* | *0* | *0* | - |
| *- Thinning & Cleanup Solvents* | *16* | *0* | *0* | *0* | *0* | *0* | - |
| - Pesticides/Fertilizers (sub-category total) | 55 | - | - | - | - | - | 30 |
| *- Farm Use* | *53* | *0* | *0* | *0* | *0* | *0* | - |
| *- Commercial Use* | *2* | *0* | *0* | *0* | *0* | *0* | - |
| - Asphalt Paving / Roofing | 32 | - | - | - | 0 | 0 | - |
| - Other (Solvent Evaporation) | - | - | - | - | - | - | - |
| Miscellaneous Processes (major category total) | 258 | 2138 | 93 | 5 | 1835 | 582 | 311 |
| - Residential Fuel Combustion (sub-category total) | 56 | 823 | 75 | 4 | 119 | 115 | 6 |
| *- Wood Combustion* | *53* | *795* | *10* | *2* | *114* | *110* | *6* |
| *- Cooking And Space Heating* | *3* | *24* | *54* | *2* | *5* | *5* | - |
| *- Other* | *1* | *4* | *10* | *0* | *1* | *1* | - |
| - Farming Operations (sub-category total) | 118 | - | - | - | 164 | 34 | 252 |
| *- Tilling,Harvesting, & Growing* | *0* | *0* | *0* | *0* | *145* | *32* | - |
| *- Livestock* | *118* | *0* | *0* | *0* | *19* | *2* | *252* |

* Includes directly emitted particulate matter only.

Table 2-2 (continued)

# 2004 Statewide Emission Inventory by Sub-Category

| Division / Major Category / Sub-Category | ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
|---|---|---|---|---|---|---|---|
| | Emissions (tons/day, annual average) | | | | | | |
| **Area-Wide Sources (division total) (continued)** | | | | | | | |
| Miscellaneous Processes (major category) (continued) | | | | | | | |
| - Construction And Demolition (sub-category total) | - | - | - | - | 200 | 42 | - |
| *- Building* | *0* | *0* | *0* | *0* | *114* | *24* | - |
| *- Road Construction Dust* | *0* | *0* | *0* | *0* | *86* | *18* | - |
| - Paved Road Dust | - | - | - | - | 406 | 80 | - |
| - Unpaved Road Dust | - | - | - | - | 475 | 100 | - |
| - Fugitive Windblown Dust (sub-category total) | - | - | - | - | 312 | 68 | - |
| *- Farm Lands* | *0* | *0* | *0* | *0* | *180* | *40* | - |
| *- Pasture Lands* | *0* | *0* | *0* | *0* | *19* | *4* | - |
| *- Unpaved Roads* | *0* | *0* | *0* | *0* | *114* | *24* | - |
| - Fires | 1 | 10 | 0 | - | 1 | 1 | - |
| - Managed Burning and Disposal (sub-category total) | 78 | 1304 | 17 | 1 | 132 | 123 | 1 |
| *- Agricultural Burning* | *19* | *216* | *6* | *0* | *26* | *24* | *1* |
| *- Non-Agricultural Burning* | *58* | *1088* | *12* | *0* | *107* | *98* | - |
| *- Other* | *0* | *0* | *0* | *0* | *0* | *0* | - |
| - Cooking | 6 | 0 | - | - | 25 | 19 | - |
| - Other (Miscellaneous Processes) | 0 | 1 | 0 | - | 1 | 1 | 53 |

* Includes directly emitted particulate matter only.

Table 2-2 (continued)

# 2004 Statewide Emission Inventory by Sub-Category

| Division<br>Major Category<br>Sub-Category | Emissions (tons/day, annual average) | | | | | | |
|---|---|---|---|---|---|---|---|
| | ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
| **Mobile Sources (division total)** | 1299 | 11259 | 2527 | 74 | 119 | 97 | 103 |
| On-Road Motor Vehicles (major category total) | 824 | 8172 | 1589 | 12 | 49 | 34 | 103 |
| - Light Duty Passenger (sub-category total) | 381 | 3596 | 330 | 2 | 17 | 10 | 60 |
| *- Non-Evaporative* | *216* | *3594* | *328* | *2* | *17* | *10* | *60* |
| *- Evaporative* | *164* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *1* | *1* | *3* | *0* | *0* | *0* | *0* |
| - Light Duty Trucks(<3750 lbs.) (sub-category total) | 139 | 1515 | 135 | 1 | 5 | 3 | 15 |
| *- Non-Evaporative* | *78* | *1513* | *131* | *1* | *5* | *3* | *15* |
| *- Evaporative* | *60* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *0* | *2* | *5* | *0* | *0* | *0* | *0* |
| - Light Duty Trucks (>3750 lbs) (sub-category total) | 108 | 1212 | 154 | 1 | 6 | 4 | 17 |
| *- Non-Evaporative* | *65* | *1211* | *152* | *1* | *6* | *4* | *17* |
| *- Evaporative* | *42* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *0* | *1* | *2* | *0* | *0* | *0* | *0* |
| - Medium Duty Trucks (sub-category total) | 59 | 628 | 91 | 0 | 3 | 2 | 7 |
| *- Non-Evaporative* | *38* | *627* | *88* | *0* | *3* | *2* | *7* |
| *- Evaporative* | *21* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *0* | *1* | *3* | *0* | *0* | *0* | *0* |
| - Light Heavy Duty Gas Trucks (<10000 lbs) (sub-category total) | 20 | 132 | 17 | 0 | 0 | 0 | 1 |
| *- Non-Evaporative* | *11* | *132* | *17* | *0* | *0* | *0* | *1* |
| *- Evaporative* | *9* | *0* | *0* | *0* | *0* | *0* | *0* |
| - Light Heavy Duty Gas Trucks (>10000 lbs) (sub-category total) | 5 | 36 | 6 | 0 | 0 | 0 | 0 |
| *- Non-Evaporative* | *2* | *36* | *6* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *2* | *0* | *0* | *0* | *0* | *0* | *0* |
| - Medium Heavy Duty Gas Trucks (sub-category total) | 28 | 219 | 21 | 0 | 0 | 0 | 0 |
| *- Non-Evaporative* | *18* | *219* | *21* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *10* | *0* | *0* | *0* | *0* | *0* | *0* |

* Includes directly emitted particulate matter only.

Table 2-2 (continued)

# 2004 Statewide Emission Inventory by Sub-Category

| Division<br>Major Category<br>Sub-Category | Emissions (tons/day, annual average) | | | | | | |
|---|---|---|---|---|---|---|---|
| | ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
| **Mobile Sources (division total) (continued)** | | | | | | | |
| On-Road Motor Vehicles (major category) (continued) | | | | | | | |
| - Heavy Heavy Duty Gas Trucks (sub-category total) | 21 | 277 | 42 | 0 | 0 | 0 | 0 |
| *- Non-Evaporative* | *16* | *277* | *42* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *5* | *0* | *0* | *0* | *0* | *0* | *0* |
| - Light Heavy Duty Diesel Trucks (<10000 lbs) | 1 | 3 | 19 | 0 | 0 | 0 | 0 |
| - Light Heavy Duty Diesel Trucks (>10000 lbs) | 1 | 3 | 16 | 0 | 0 | 0 | 0 |
| - Medium Heavy Duty Diesel Trucks | 4 | 24 | 141 | 2 | 4 | 3 | 0 |
| - Heavy Heavy Duty Diesel Trucks | 22 | 96 | 527 | 6 | 12 | 10 | 0 |
| - Motorcycles (Mcy) (sub-category total) | 20 | 164 | 5 | - | 0 | 0 | 0 |
| *- Non-Evaporative* | *14* | *164* | *5* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *7* | *0* | *0* | *0* | *0* | *0* | *0* |
| - Heavy Duty Diesel Urban Buses | 2 | 9 | 46 | 0 | 1 | 1 | - |
| - Heavy Duty Gas Urban Buses (sub-category total) | 6 | 70 | 8 | 0 | 0 | 0 | 0 |
| *- Non-Evaporative* | *6* | *70* | *8* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |
| - School Buses (sub-category total) | 2 | 20 | 15 | 0 | 1 | 0 | 0 |
| *- Non-Evaporative* | *1* | *17* | *1* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *1* | *3* | *14* | *0* | *1* | *0* | *0* |
| - Motor Homes (sub-category total) | 6 | 169 | 16 | 0 | 0 | 0 | 0 |
| *- Non-Evaporative* | *6* | *168* | *13* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *0* | *0* | *3* | *0* | *0* | *0* | *0* |

* Includes directly emitted particulate matter only.

Table 2-2 (continued)

# 2004 Statewide Emission Inventory by Sub-Category

| Division<br>Major Category<br>Sub-Category | ROG | CO | $NO_x$ | $SO_x$ | $PM_{10}$* | $PM_{2.5}$* | $NH_3$ |
|---|---|---|---|---|---|---|---|
| | Emissions (tons/day, annual average) | | | | | | |
| **Mobile Sources (division total) (continued)** | | | | | | | |
| Other Mobile Sources (major category total) | 476 | 3087 | 938 | 62 | 70 | 63 | 0 |
| - Aircraft | 42 | 266 | 53 | 3 | 7 | 7 | - |
| - Trains | 9 | 33 | 177 | 17 | 5 | 5 | - |
| - Ships And Commercial Boats (sub-category total) | 7 | 15 | 76 | 40 | 6 | 6 | - |
| *- Residual Oil* | *0* | *0* | *3* | *4* | *1* | *1* | *0* |
| *- Diesel* | *6* | *11* | *70* | *36* | *5* | *5* | *0* |
| *- Gasoline* | *0* | *3* | *0* | *0* | *0* | *0* | *0* |
| *- Other Fuel* | *0* | *1* | *3* | *0* | *0* | *0* | *0* |
| - Recreational Boats (sub-category total) | 118 | 662 | 30 | 1 | 9 | 7 | - |
| *- Non-Evaporative* | *107* | *661* | *27* | *1* | *9* | *7* | *0* |
| *- Evaporative* | *10* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *1* | *1* | *3* | *0* | *0* | *0* | *0* |
| - Off-Road Recreational Vehicles (sub-category total) | 51 | 261 | 4 | 0 | 0 | 0 | - |
| *- Snowmobiles* | *43* | *138* | *3* | *0* | *0* | *0* | *0* |
| *- Motorcycles* | *3* | *45* | *0* | *0* | *0* | *0* | *0* |
| *- All-Terrain Vehicles* | *2* | *42* | *0* | *0* | *0* | *0* | *0* |
| *- Four-Wheel Drive Vehicles* | *3* | *36* | *2* | *0* | *0* | *0* | *0* |
| - Off-Road Equipment (sub-category total) | 188 | 1727 | 471 | 1 | 33 | 30 | - |
| *- Lawn And Garden Equipment* | *112* | *822* | *15* | *0* | *3* | *3* | |
| *- Non-Evaporative* | *80* | *819* | *9* | *0* | *3* | *2* | *0* |
| *- Evaporative* | *31* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *1* | *3* | *6* | *0* | *0* | *0* | *0* |
| *- Commercial & Industrial Equipment* | *76* | *905* | *456* | *1* | *30* | *27* | *0* |
| *- Non-Evaporative* | *29* | *652* | *30* | *0* | *2* | *2* | *0* |
| *- Evaporative* | *3* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *44* | *170* | *398* | *0* | *28* | *26* | *0* |
| *- Natural Gas* | *1* | *82* | *29* | *0* | *0* | *0* | *0* |
| - Farm Equipment (sub-category total) | 18 | 124 | 127 | 1 | 8 | 8 | - |
| *- Non-Evaporative* | *2* | *67* | *2* | *0* | *0* | *0* | *0* |
| *- Evaporative* | *1* | *0* | *0* | *0* | *0* | *0* | *0* |
| *- Diesel* | *15* | *57* | *125* | *1* | *8* | *8* | *0* |
| - Fuel Storage and Handling | 42 | - | - | - | - | - | - |
| **Total Statewide - All Sources** | **2512** | **13802** | **3126** | **213** | **2086** | **765** | **493** |

* Includes directly emitted particulate matter only.

Table 2-2 (continued)

# *Ozone*

## 2004 Statewide Emission Inventory - Ozone Precursors by Category

### $NO_x$ Sources - Statewide

$NO_x$ is a group of gaseous compounds of nitrogen and oxygen, many of which contribute to the formation of ozone, $PM_{10}$, and $PM_{2.5}$. Most $NO_x$ emissions are produced by the combustion of fuels. Industrial sources report $NO_x$ emissions to local air districts and to the ARB. Other sources of $NO_x$ emissions are estimated by the local air districts and the ARB. Mobile sources (including on-road and other) make up about 81 percent of the total statewide $NO_x$ emissions. Area-wide sources, which include residential fuel combustion, managed burning and disposal, commercial cooking, and fires, contribute only a small portion of the total $NO_x$ emissions.

### ROG Sources - Statewide

Reactive organic gases (ROG) are volatile organic compounds that are photochemically reactive and contribute to the formation of ozone, as well as $PM_{10}$ and $PM_{2.5}$. These emissions result primarily from incomplete fuel combustion and the evaporation of chemical solvents and fuels. On-road mobile sources are the largest contributors to statewide ROG emissions. Stationary sources of ROG emissions include processes that use solvents (such as dry cleaning, degreasing, and coating operations) and petroleum-related processes (such as petroleum refining and marketing and oil and gas extraction). Area-wide ROG sources include consumer products, pesticides, aerosol and architectural coatings, asphalt paving and roofing, and other evaporative emissions.

| $NO_X$ Emissions (annual average) | | |
|---|---|---|
| **Emissions Source** | **tons/day** | **Percent** |
| **Stationary Sources** | 506 | 16% |
| **Area-wide Sources** | 93 | 3% |
| **On-Road Mobile** | 1589 | 51% |
| Gasoline Vehicles | 845 | 27% |
| Diesel Vehicles | 743 | 24% |
| **Other Mobile** | 938 | 30% |
| Gasoline Vehicles | 76 | 2% |
| Diesel Vehicles | 778 | 25% |
| Other | 85 | 3% |
| ***Total Statewide*** | ***3126*** | ***100%*** |

Table 2-3

| ROG Emissions (annual average) | | |
|---|---|---|
| **Emissions Source** | **tons/day** | **Percent** |
| **Stationary Sources** | 505 | 20% |
| **Area-wide Sources** | 707 | 28% |
| **On-Road Mobile** | 824 | 33% |
| Gasoline Vehicles | 794 | 32% |
| Diesel Vehicles | 30 | 1% |
| **Other Mobile** | 476 | 19% |
| Gasoline Vehicles | 357 | 14% |
| Diesel Vehicles | 75 | 3% |
| Other | 43 | 2% |
| ***Total Statewide*** | ***2512*** | ***100%*** |

Table 2-4

# Largest Stationary Sources Statewide

## Largest Stationary Sources of $NO_x$ Statewide

| Air Basin | Facility Name | City | Tons/Year |
|---|---|---|---|
| Mojave Desert | TXI Riverside Cement Company | Oro Grande | 4609 |
| Mojave Desert | Cemex - Black Mountain Quarry | Apple Valley | 4483 |
| Mojave Desert | California Portland Cement | Mojave | 2942 |
| San Francisco Bay Area | Shell Martinez Refinery | Martinez | 2898 |
| San Francisco Bay Area | Tesoro Refining And Marketing | Martinez | 2307 |
| San Francisco Bay Area | Valero Refining Company | Benicia | 2289 |
| Mojave Desert | Mitsubishi Cement 2000 | Lucerne Valley | 2245 |
| San Francisco Bay Area | Chevron Products Company | Richmond | 2063 |
| Mojave Desert | Searles Valley Minerials | Trona | 2026 |
| San Francisco Bay Area | Hanson Permanente Cement | Cupertino | 1935 |

Table 2-5

## Largest Stationary Sources of ROG Statewide

| Air Basin | Facility Name | City | Tons/Year |
|---|---|---|---|
| San Francisco Bay Area | Tesoro Refining And Marketing | Martinez | 2041 |
| San Francisco Bay Area | Chevron Products Company | Richmond | 1637 |
| San Francisco Bay Area | Shell Martinez Refinery | Martinez | 1462 |
| South Coast | Chevron USA | El Segundo | 870 |
| San Francisco Bay Area | Conoco Phillips - San Francisco | Rodeo | 769 |
| San Francisco Bay Area | New United Motor Manufacturing | Fremont | 581 |
| South Coast | Mobil Oil | Torrance | 573 |
| San Joaquin Valley | Crimson Resource Management (Natural Gas) | Taft | 448 |
| South Coast | West Coast Products | Carson | 409 |
| San Francisco Bay Area | Valero Refining Company | Benicia | 389 |

Table 2-6

Facility totals are the most recent available data. Some facilities may have reduced or increased emissions since these data were collected. These changes will be reflected in subsequent almanacs.
The list of facilities does not include military bases, landfills, or airports.

# Statewide Emissions Maps - Ozone Precursors

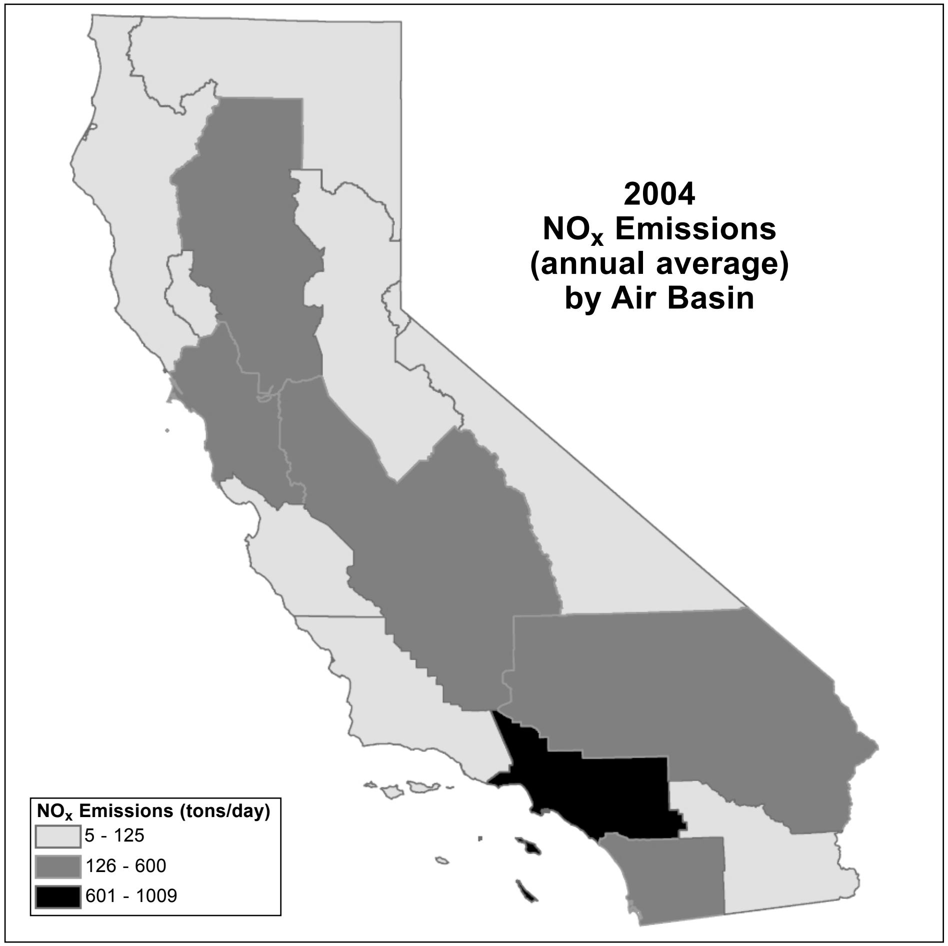


Figure 2-3


Figure 2-4

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# Ozone - 2003 Air Quality

Air quality as it relates to ozone has improved greatly in California over the last several decades, although not uniformly throughout the State. However, despite aggressive emission controls, maximum measured ozone concentrations still exceed the State standard in 10 of the 15 air basins. Maximum measured values exceed the national 1-hour standard in seven air basins and exceed the national 8-hour standard in 10 air basins. California's highest ozone concentrations occur in the South Coast Air Basin, where the peak 1-hour indicator is close to two times the level of the State standard.

Ozone concentrations are generally lower near the coast than they are inland, and rural areas tend to be cleaner than urban areas. This can be explained in part by the characteristics of ozone, including pollutant reactivity, transport, and deposition. Based on current ozone concentrations, substantial additional emission control measures will be needed to attain the standards throughout the State. 2003 air quality data for California's five largest air basins can be found in Chapter 4, along with information on 8-hour ozone concentrations, and preliminary 2004 ozone data.

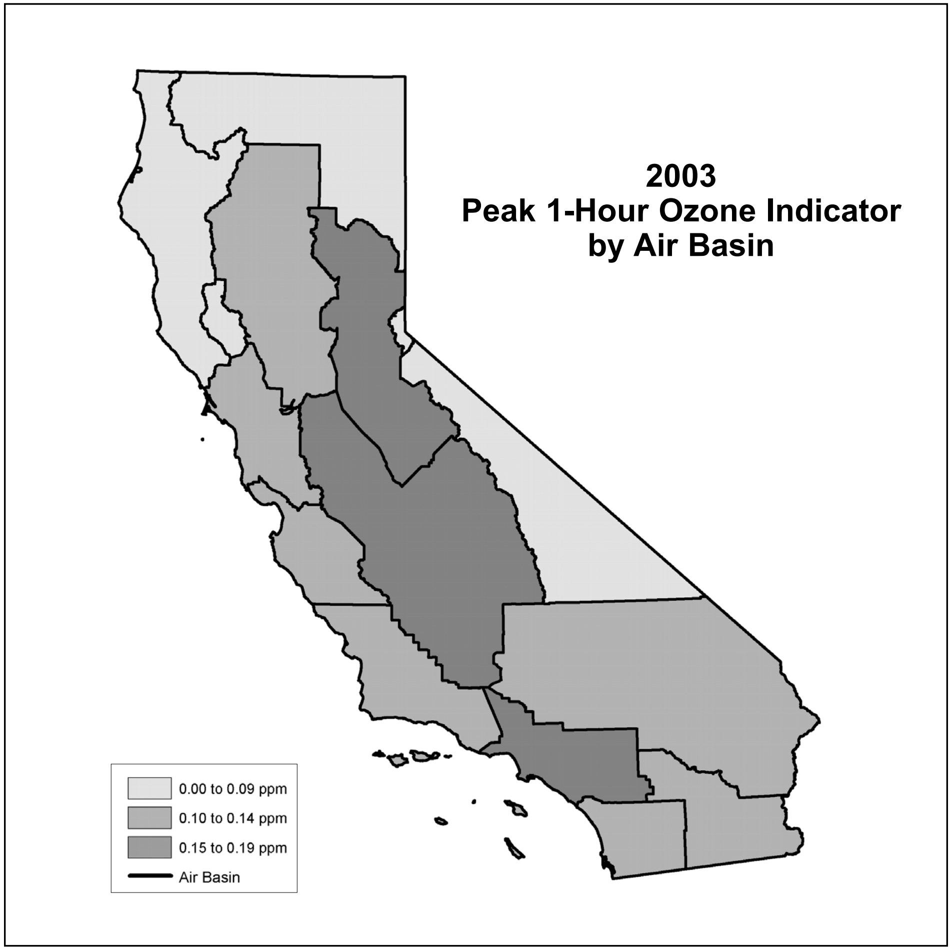


Figure 2-5

# Ozone - 2003 Air Quality Tables

**Maximum Peak 1-Hour and 8-Hour Indicator and Exceedance Days by Air Basin**

| AIR BASIN | 2003 Maximum Peak Indicator in parts per million | | Number of Days in 2003 Above the Standard | | |
|---|---|---|---|---|---|
| | | | State | National | |
| | 1-Hour | 8-Hour | 1-Hour | 1-Hour | 8-Hour |
| Great Basin Valleys Air Basin | 0.09 | 0.08 | 0 | 0 | 0 |
| Lake County Air Basin | 0.08 | 0.07 | 0 | 0 | 0 |
| Lake Tahoe Air Basin | 0.09 | 0.08 | 0 | 0 | 0 |
| Mojave Desert Air Basin | 0.14 | 0.12 | 93 | 13 | 74 |
| Mountain Counties Air Basin | 0.15 | 0.12 | 56 | 6 | 56 |
| North Central Coast Air Basin | 0.10 | 0.09 | 3 | 0 | 2 |
| North Coast Air Basin | 0.08 | 0.07 | 0 | 0 | 0 |
| Northeast Plateau Air Basin | 0.08 | 0.07 | 0 | 0 | 0 |
| Sacramento Valley Air Basin | 0.14 | 0.11 | 51 | 5 | 40 |
| Salton Sea Air Basin | 0.14 | 0.12 | 66 | 7 | 47 |
| San Diego Air Basin | 0.12 | 0.10 | 23 | 1 | 6 |
| San Francisco Bay Area Air Basin | 0.13 | 0.10 | 19 | 1 | 7 |
| San Joaquin Valley Air Basin | 0.15 | 0.12 | 137 | 37 | 134 |
| South Central Coast Air Basin | 0.12 | 0.10 | 45 | 2 | 35 |
| South Coast Air Basin | 0.18 | 0.15 | 125 | 64 | 109 |

Table 2-7

## Top Sites with Peak 1-Hour Indicator Values above the State Ozone Standard

### Great Basin Valleys Air Basin
- Death Valley National Monument

### Lake Tahoe Air Basin
- Echo Summit

### Mojave Desert Air Basin
- Joshua Tree-National Monument
- Lancaster-43301 Division Street
- Phelan-Beekley Rd. & Phelan Rd.
- Hesperia-Olive Street
- Victorville-14306 Park Avenue

### Mountain Counties Air Basin
- Cool-Highway 193
- Colfax-City Hall
- Placerville-Gold Nugget Way
- Grass Valley-Litton Building
- San Andreas-Gold Strike Road

### North Central Coast Air Basin
- Pinnacles National Monument
- Hollister-Fairview Road

### Sacramento Valley Air Basin
- Folsom-Natoma Street
- Sacramento-Del Paso Manor
- Auburn-Dewitt C Avenue
- Roseville-N Sunrise Blvd.
- Sloughhouse

### Salton Sea Air Basin
- Palm Springs-Fire Station
- Calexico-Ethel Street
- El Centro-9th Street
- Calexico-Grant Street
- Indio-Jackson Street

### San Diego Air Basin
- Alpine-Victoria Drive
- San Diego-Overland Avenue
- Escondido-East Valley Parkway
- El Cajon-Redwood Avenue
- Camp Pendleton

### San Francisco Bay Area Air Basin
- Livermore-793 Rincon Avenue
- San Martin-Murphy Avenue
- Los Gatos
- Gilroy-9th Street
- Concord-2975 Treat Blvd.

### San Joaquin Valley Air Basin
- Parlier
- Arvin-Bear Mountain Blvd.
- Fresno-1st Street
- Fresno-Sierra Skypark #2
- Clovis-North Villa Avenue

### South Central Coast Air Basin
- Simi Valley-Cochran Street
- Ojai-Ojai Avenue
- Piru-3301 Pacific Avenue
- Thousand Oaks-Moorpark Road
- Paradise Rd.-Los Padres Nat'l Forest

### South Coast Air Basin
- Fontana-Arrow Highway
- Santa Clarita
- Crestline
- Redlands-Dearborn
- Glendora-Laurel

Table 2-8

Sites with 1-hour peak indicator values above the level of the State ozone standard during 2003. The top five sites in each air basin are listed in descending order of their peak indicator value. If an air basin is not listed, the peak indicator values at sites in that air basin were not above the State ozone standard.

## The Nature of Particulate Matter ($PM_{10}$ and $PM_{2.5}$)

$PM_{10}$ is a mixture of particles and droplets that vary in size and chemical composition, depending on each particle's origin. $PM_{10}$ includes the subsets of "coarse" particles, those between 2.5 microns and 10 microns in diameter ($PM_{2.5-10}$), and "fine" particles, those 2.5 microns or smaller ($PM_{2.5}$). Particulate matter can be directly emitted into the air in the form of dust and soot (primary PM) or, similar to ozone, it can be formed in the atmosphere from the reaction of gaseous precursors such as $NO_x$, $SO_x$, ROG, and ammonia (secondary PM). Primary particles are mostly coarse in size, but include some fine particles, while secondary particles are mostly fine.

Sources of ambient PM include: combustion sources such as trucks and passenger cars, off-road equipment, industrial processes, residential wood burning, and forest/agricultural burning; fugitive dust from paved and unpaved roads, construction, mining, and agricultural activities; and ammonia sources such as livestock operations, fertilizer application, and motor vehicles. In general, combustion processes emit and form fine particles, whereas particles from dust sources tend to fall in the coarse range.

The levels and chemical make-up of ambient PM vary widely from one area to another. In some areas, PM levels vary strongly by season. This is due to seasonal activity increase for some emissions sources and to weather conditions that are conducive to the build-up of PM. Seasonal sources of PM include wildfires, agricultural processes, dust storms, and residential wood burning. Stagnant conditions and cool temperatures during the winter contribute to the formation of secondary ammonium nitrate and ammonium sulfate, leading to higher ambient $PM_{2.5}$ concentrations. Dry weather and windy conditions cause higher coarse PM emissions, resulting in elevated $PM_{10}$ concentrations.

The remainder of the discussion on PM includes summary emission inventory data for directly emitted $PM_{10}$ and $PM_{2.5}$, summary information on ambient $PM_{10}$ and $PM_{2.5}$ concentrations, and description of the link between source emissions and ambient PM concentrations in selected regions of the State.

Consistent with last year's almanac, is the reporting of both State and national annual averages for $PM_{10}$ and $PM_{2.5}$. State and national annual averages may differ for several reasons: 1) the State and national criteria for assessing data completeness are different, 2) different monitors are approved for assessing compliance with each standard, and 3) the State standard uses local conditions while the national standard uses standard conditions for data reporting.

# *Directly Emitted Particulate Matter ($PM_{10}$)*

## 2004 Statewide Emission Inventory - Directly Emitted $PM_{10}$ by Category

Area-wide sources account for about 88 percent of the statewide emissions of directly emitted $PM_{10}$. The major area-wide source of $PM_{10}$ is fugitive dust, especially dust from unpaved and paved roads, agricultural operations, and construction and demolition. Fugitive dust emissions from unpaved and paved roads are related to motor vehicle population levels due to vehicular travel on both types of roads. Other sources of $PM_{10}$ emissions include brake and tire wear, residential wood burning, and industrial sources. Exhaust emissions from mobile sources contribute a relatively small portion of directly emitted $PM_{10}$ emissions but are a major source of the ROG and $NO_x$ that form secondary particles. The section titled *$PM_{10}$ and $PM_{2.5}$ - Linking Emissions Sources with Air Quality* describes how emissions from specific sources are linked to measured $PM_{10}$ levels

| $PM_{10}$ Emissions (annual average) | | |
|---|---|---|
| **Emissions Source** | **tons/day** | **Percent** |
| **Stationary Sources** | 131 | 6% |
| **Area-wide Sources** | 1835 | 88% |
| **On-Road Mobile** | 49 | 2% |
| Gasoline Vehicles | 32 | 2% |
| Diesel Vehicles | 18 | 1% |
| **Other Mobile** | 70 | 3% |
| Gasoline Vehicles | 15 | 1% |
| Diesel Vehicles | 47 | 2% |
| Other | 8 | 0% |
| ***Total Statewide*** | ***2086*** | ***100%*** |

Table 2-9

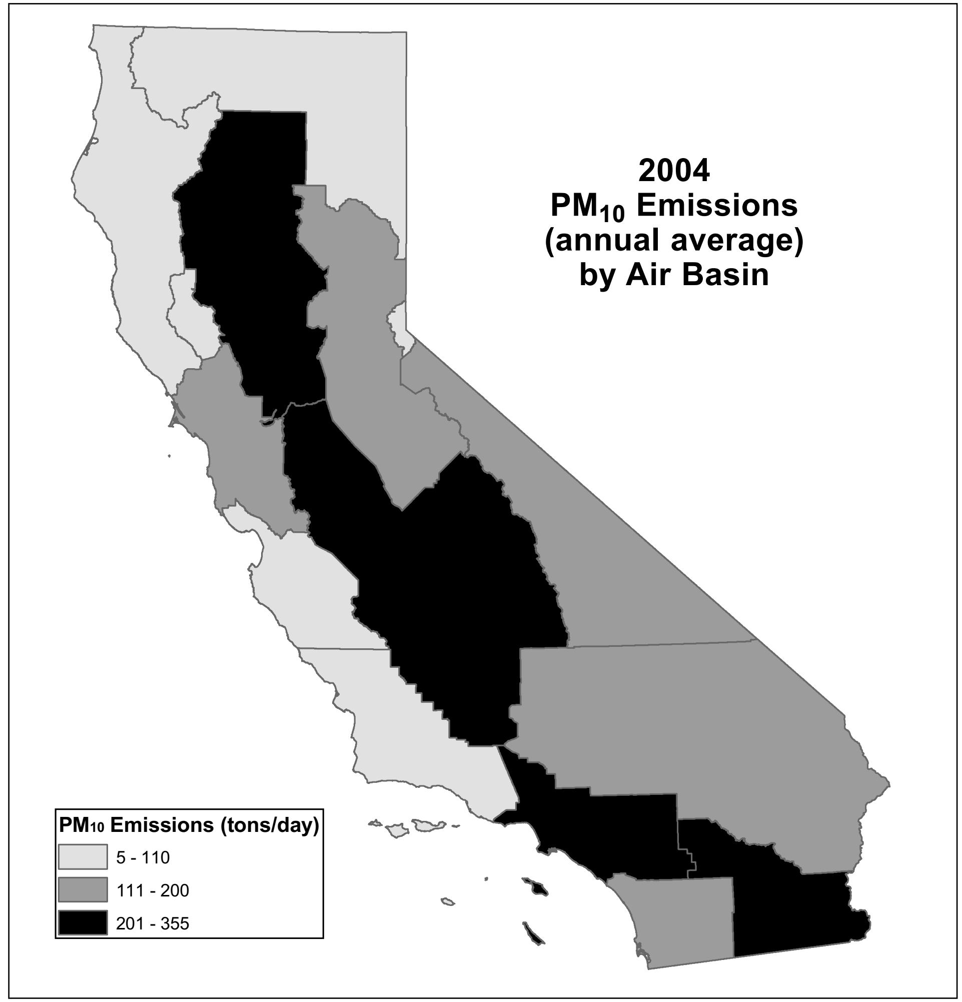


Figure 2-6

# *Largest Stationary Sources Statewide*

## Largest Stationary Sources of Directly Emitted $PM_{10}$ Statewide

| Air Basin | Facility Name | City | Tons/Year |
|---|---|---|---|
| Mojave Desert | TXI Riverside Cement Company | Oro Grande | 1470 |
| Mojave Desert | Antelope Valley Aggregate | Littlerock | 757 |
| Mojave Desert | US Borax | Boron | 618 |
| Mojave Desert | Mitsubishi Cement 2000 | Lucerne Valley | 600 |
| Mountain Counties | Sierrapine Ltd Ampine Division | Martell | 518 |
| South Coast | AES Alamitos | Long Beach | 405 |
| Mojave Desert | National Cement | Lebec | 371 |
| San Francisco Bay Area | Shell Martinez Refinery | Martinez | 357 |
| Mojave Desert | California Portland Cement | Mojave | 329 |
| Mojave Desert | Searles Valley Minerials | Trona | 326 |

Facility totals are the most recent available data. Some facilities may have reduced or increased emissions since these data were collected. These changes will be reflected in subsequent editions of the almanac.
The list of facilities does not include military bases, landfills, or airports.

Table 2-10

# *Directly Emitted Particulate Matter ($PM_{2.5}$)*

## 2004 Statewide Emission Inventory - Directly Emitted $PM_{2.5}$ by Category

Area-wide sources account for about 76 percent of the statewide emissions of directly emitted $PM_{2.5}$. The major area-wide source of $PM_{2.5}$ is fugitive dust, especially dust from unpaved and paved roads, agricultural operations, and construction and demolition. Fugitive dust emissions from unpaved and paved roads are related to motor vehicle population levels due to vehicular travel on both types of roads. Other sources of $PM_{2.5}$ emissions include brake and tire wear, residential wood burning, and industrial sources. Exhaust emissions from mobile sources contribute only a very small portion of directly emitted $PM_{2.5}$ emissions, but are a major source of the ROG and $NO_x$ that form secondary particles. The section titled *$PM_{10}$ and $PM_{2.5}$ - Linking Emissions Sources with Air Quality* describes how emissions from specific sources are linked to measured $PM_{2.5}$ levels

| $PM_{2.5}$ Emissions (annual average) | | |
|---|---|---|
| **Emissions Source** | **tons/day** | **Percent** |
| **Stationary Sources** | 86 | 11% |
| **Area-wide Sources** | 582 | 76% |
| **On-Road Mobile** | 34 | 4% |
| Gasoline Vehicles | 19 | 2% |
| Diesel Vehicles | 15 | 2% |
| **Other Mobile** | 63 | 8% |
| Gasoline Vehicles | 12 | 2% |
| Diesel Vehicles | 43 | 6% |
| Other | 8 | 1% |
| ***Total Statewide*** | ***765*** | ***100%*** |

Table 2-11

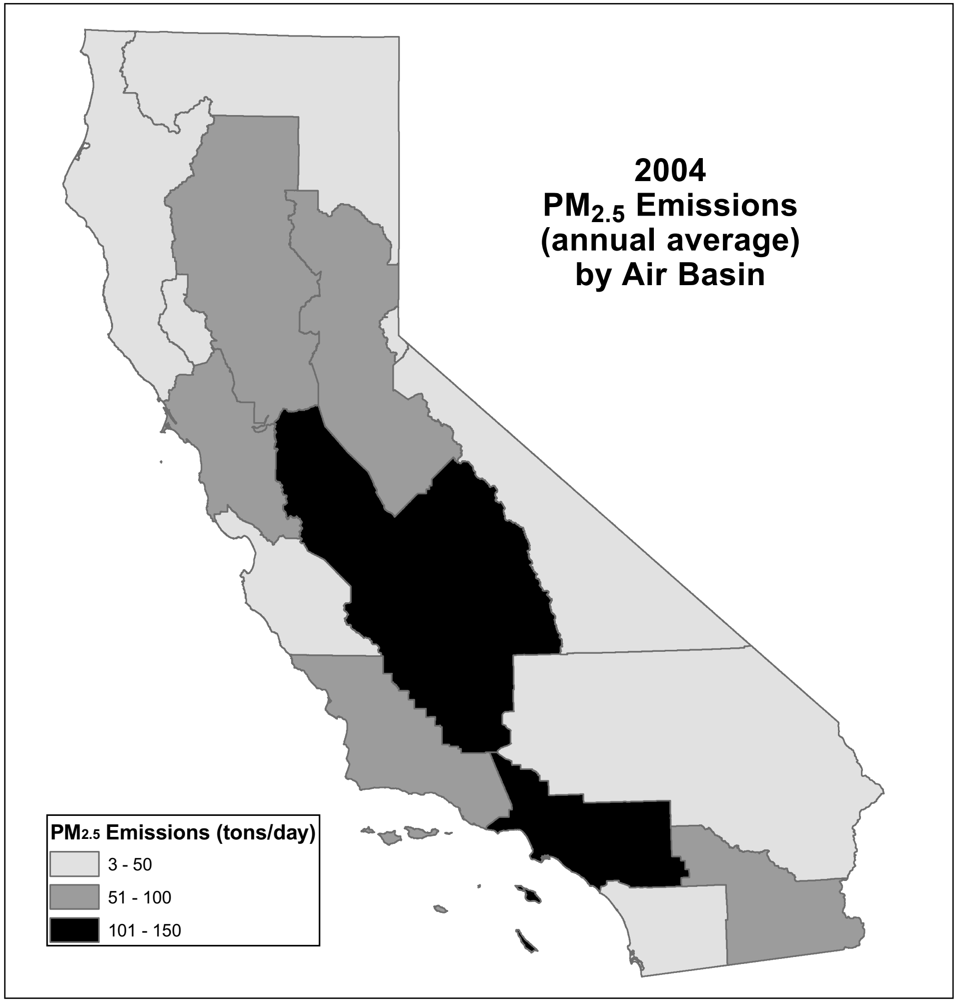


Figure 2-7

## *Largest Stationary Sources Statewide*

### Largest Stationary Sources of Directly Emitted $PM_{2.5}$ Statewide

| Air Basin | Facility Name | City | Tons/Year |
|---|---|---|---|
| Mountain Counties | Sierrapine Ltd Ampine Division | Martell | 414 |
| South Coast | AES Alamitos | Long Beach | 405 |
| San Francisco Bay Area | Shell Martinez Refinery | Martinez | 346 |
| Mojave Desert | TXI Riverside Cement Company | Oro Grande | 316 |
| Mojave Desert | Antelope Valley Aggregate | Littlerock | 286 |
| Mountain Counties | Wheelabrator Martell | Martell | 285 |
| Mojave Desert | Mitsubishi Cement 2000 | Lucerne Valley | 277 |
| South Coast | West Coast Products | Carson | 246 |
| South Coast | Chevron USA | El Segundo | 239 |
| Mojave Desert | Searles Valley Minerials | Trona | 226 |

Facility totals are the most recent available data. Some facilities may have reduced or increased emissions since these data were collected. These changes will be reflected in subsequent editions of the almanac.
The list of facilities does not include military bases, landfills, or airports.

Table 2-12

# $PM_{10}$ - 2003 Air Quality

Most areas of California have either 24-hour or annual $PM_{10}$ concentrations that exceed the State standards. Some areas exceed both State standards. Several areas, both urban and rural, also exceed the national standards. The highest annual average values during 2003 occurred in the Salton Sea, Great Basin Valleys, South Coast, San Joaquin Valley, and San Diego Air Basins. The 2003 data are summarized in table 2-13. The highest 24-hour concentrations generally occurred in the desert areas where wind-blown dust contributes to local $PM_{10}$ problems.

Particles resulting from combustion contribute to high $PM_{10}$ in a number of urban areas. While many of the control programs implemented for ozone will also reduce $PM_{10}$, more controls specifically for $PM_{10}$ will be needed to reach attainment.

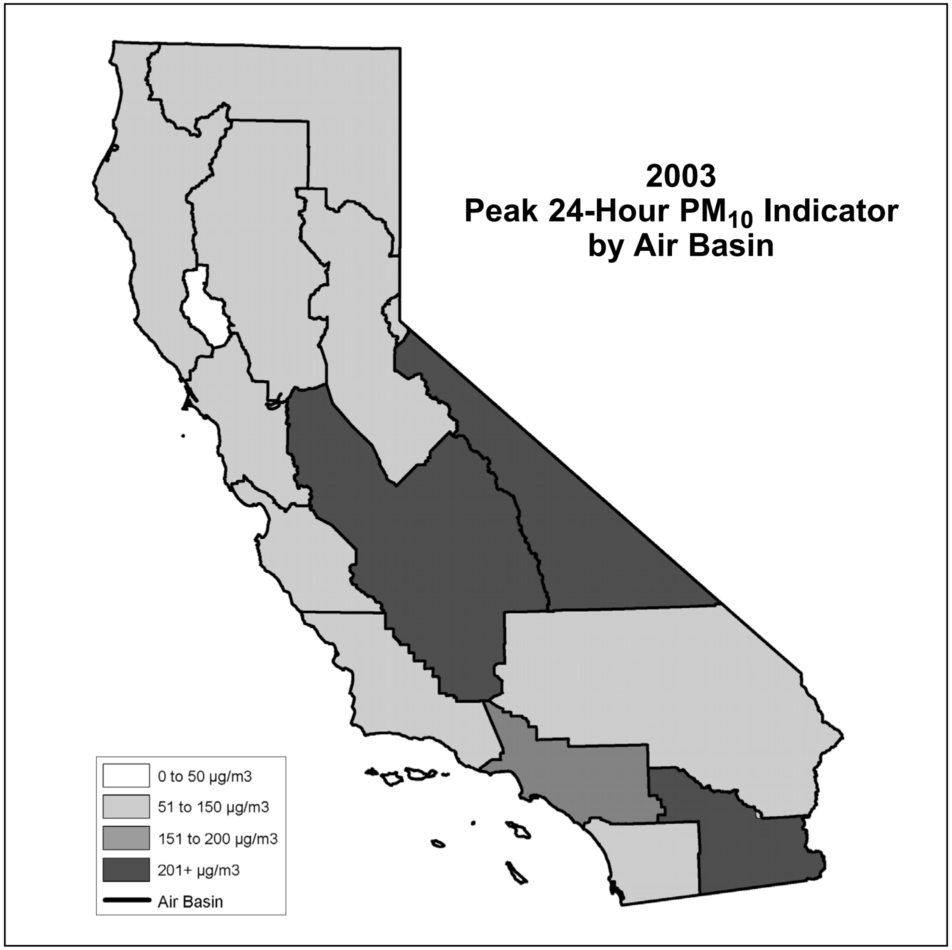


Figure 2-8

# $PM_{10}$ - 2003 Air Quality Tables

**Maximum 24-Hour and Annual $PM_{10}$ Concentrations by Air Basin**

| AIR BASIN | 2003 Maximum 24-Hour Concentration in micrograms/cubic meter* | | 2003 Maximum Annual Average of Quarters in micrograms/cubic meter | |
|---|---|---|---|---|
| | State | National | State | National |
| Great Basin Valleys Air Basin | 15641 | 16462 | 130.4 | 38.8 |
| Lake County Air Basin | 32 | | 10.0 | |
| Lake Tahoe Air Basin | 52 | 61 | 15.0 | 17.6 |
| Mojave Desert Air Basin | 169 | 181 | 27.9 | 33.2 |
| Mountain Counties Air Basin | 58 | 66 | 21.0 | 23.1 |
| North Central Coast Air Basin | 90 | 87 | 31.6 | 30.1 |
| North Coast Air Basin | 71 | 65 | 22.2 | 21.4 |
| Northeast Plateau Air Basin | 31 | 33 | 12.8 | 13.3 |
| Sacramento Valley Air Basin | 83 | 81 | 28.8 | 28.4 |
| Salton Sea Air Basin | 848 | 840 | 79.7 | 80.0 |
| San Diego Air Basin | 289 | 280 | 52.6 | 52.1 |
| San Francisco Bay Area Air Basin | 60 | 58 | 24.8 | 24.2 |
| San Joaquin Valley Air Basin | 150 | 150 | 52.3 | 52.4 |
| South Central Coast Air Basin | 169 | 149 | 30.0 | 30.7 |
| South Coast Air Basin | 164 | 164 | 56.9 | 55.6 |

* The table lists the highest value for each statistic. Within an air basin, the highest value for each statistic may reflect a different site.

**24-hour data** - The table may include data from extreme, exceptional, or unusual concentration events: however, there is a mechanism in place to review for these types of events during the area designation process.

**Annual average data** - Extreme, exceptional, or unusual concentration events do not generally significantly influence the annual average. However, their exclusion can be considered on a case-by-case basis.

Table 2-13

## Top Sites with 24-Hour Concentrations above the State $PM_{10}$ Standard

### Great Basin Valleys Air Basin
- Dirty Sox
- Shell Cut-Highway 190
- Mono Lake North Shore
- Olancha-Walker Creek Road
- Keeler-Cerro Gordo Road

### Lake Tahoe Air Basin
- South Lake Tahoe-Sandy Way

### Mojave Desert Air Basin
- Victorville-14306 Park Avenue
- Ridgecrest-100 W. California Ave.
- Barstow
- Hesperia-Olive Street
- Trona-Athol and Telegraph

### Mountain Counties Air Basin
- Yosemite Village-Visitor Center
- Placerville-Gold Nugget Way

### North Central Coast Air Basin
- Moss Landing-Sandholt Road
- Davenport
- Salinas-#3

### North Coast Air Basin
- Eureka-Health Dept. 6th and I Street
- Fort Bragg-North Franklin Street
- Weaverville-Courthouse

### Sacramento Valley Air Basin
- Yuba City-Almond Street
- Sacramento-Branch Center Road
- West Sacramento-15th Street
- Colusa-Sunrise Blvd.
- Sacramento-T Street

### Salton Sea Air Basin
- Westmorland-West 1st Street
- Brawley-Main Street
- Niland-English Road
- Indio-Jackson Street
- Calexico-Ethel Street

### San Diego Air Basin
- San Diego-Overland Avenue
- El Cajon-Redwood Avenue
- Escondido-East Valley Parkway
- San Diego-12th Avenue
- Otay Mesa-Paseo International

### San Francisco Bay Area Air Basin
- San Jose-Jackson Street
- Pittsburg-10th Street
- San Jose-Tully Road
- San Francisco-Arkansas Street
- Bethel Island Road

### San Joaquin Valley Air Basin
- Corcoran-Patterson Avenue
- Hanford-South Irwin Street
- Bakersfield-Golden State Highway
- Bakersfield-5558 California Avenue
- Oildale-3311 Manor Street

### South Central Coast Air Basin
- Simi Valley-Cochran Street
- El Rio-Rio Mesa School #2
- Vandenberg Air Force Base-STS Power
- Piru-3301 Pacific Avenue
- Nipomo-Regional Park

### South Coast Air Basin
- Riverside-Rubidoux
- Ontario-1408 Francis Street
- Perris
- Azusa
- Norco-Norconian

Sites with 24-hour $PM_{10}$ concentrations above the level of the State $PM_{10}$ standard during 2003. The top five sites in each air basin are listed in descending order of their maximum 24-hour concentration. If an air basin is not listed, the 24-hour $PM_{10}$ concentrations at sites in that air basin were not above the State 24-hour $PM_{10}$ standard. If more than 5 sites are listed, there were multiple sites with the same maximum concentration.

Table 2-14

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# $PM_{2.5}$ - 2003 Air Quality

As explained in the Introduction section of Chapter 1, the U.S. EPA promulgated new national standards (24-hour and annual average) for $PM_{2.5}$ in July 1997. In June 2002, the ARB established a new, more health-protective State annual average $PM_{2.5}$ standard. The installation of federally approved $PM_{2.5}$ mass monitors throughout California began in 1998 and is now complete, with monitors at 81 sites. Detailed information on California's $PM_{2.5}$ network can be found on the ARB website at *www.arb.ca.gov/aqd/pm25/pmfnet02.htm*.

The majority of sites in California's $PM_{2.5}$ network began sampling in early 1999. The 2003 data are summarized in Table 2-15. Sites in the South Coast and San Joaquin Valley Air Basins recorded the highest 24-hour concentrations, 98$^{th}$ percentile 24-hour concentrations, and annual average concentrations in the State. The annual averages for these areas were about twice the level of the State annual $PM_{2.5}$ standard. High 24-hour $PM_{2.5}$ concentrations were recorded in Southern California in the fall of 2003 due to severe wildfire impacts.

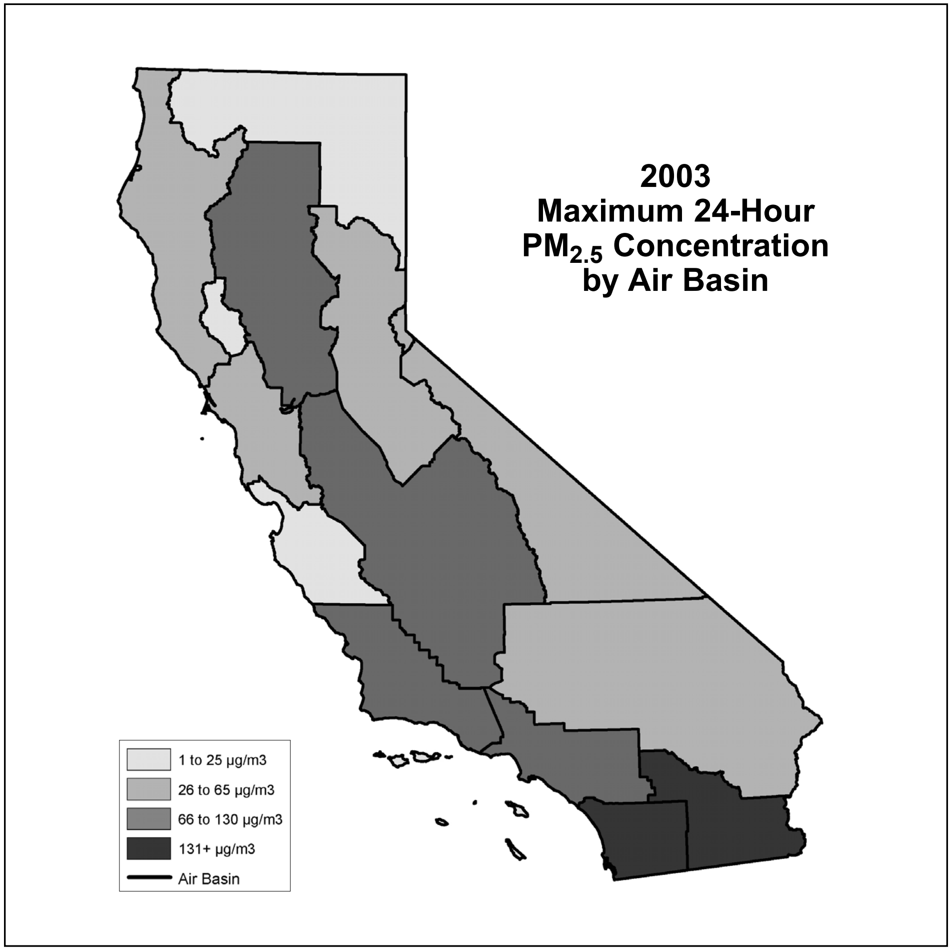


Figure 2-9

# $PM_{2.5}$ - 2003 Air Quality Tables

**Maximum 24-Hour, 98th Percentile, and Annual $PM_{2.5}$ Concentrations by Air Basin**

| AIR BASIN | 2003 Maximum 24-Hr Concentration in micrograms/cubic meter | | 98th Percentile 24-Hr Conc. (µg/m3)* | 2003 Average of Quarterly Means in micrograms/cubic meter* | |
|---|---|---|---|---|---|
| | State | National | | State | National |
| Great Basin Valleys Air Basin | 44.0 | 44.0 | 8.0 | | |
| Lake County Air Basin | 21.9 | 21.9 | 15.1 | 4.4 | 4.4 |
| Lake Tahoe Air Basin | 27.4 | 21.0 | 19.0 | 7.2 | 7.2 |
| Mojave Desert Air Basin | 28.0 | 28.0 | 24.0 | 9.4 | 11.4 |
| Mountain Counties Air Basin | 54.0 | 43.0 | 40.0 | 8.6 | 13.3 |
| North Central Coast Air Basin | 15.9 | 15.9 | 14.0 | 7.3 | 7.4 |
| North Coast Air Basin | 36.1 | 36.1 | 15.2 | 7.4 | 7.3 |
| Northeast Plateau Air Basin | 10.0 | 10.0 | | | |
| Sacramento Valley Air Basin | 73.2 | 65.0 | 43.0 | 15.9 | 12.2 |
| Salton Sea Air Basin | 153.6 | 65.1 | 24.9 | 11.4 | 11.4 |
| San Diego Air Basin | 239.2 | 239.2 | 46.9 | 14.4 | 15.5 |
| San Francisco Bay Area Air Basin | 56.1 | 56.1 | 37.4 | 11.7 | 11.7 |
| San Joaquin Valley Air Basin | 84.5 | 67.8 | 56.0 | 24.8 | 19.7 |
| South Central Coast Air Basin | 116.0 | 116.0 | 33.4 | 12.4 | 14.2 |
| South Coast Air Basin | 121.2 | 121.2 | 76.6 | 24.8 | 24.8 |

The table lists the highest value for each statistic. Within an air basin, the highest value for each statistic may reflect a different site.
* These statistics and determination of their validity are calculated according to the methods specified in 40 CFR Part 50, Appendix N. Validity is based on the number of measurements available per quarter and therefore, depends on data completeness. Both the 98th percentile concentration and the average of quarters concentration relate to the national $PM_{2.5}$ standards, while only the average of quarters concentration relates to the State $PM_{2.5}$ standard.
Table 2-15

# $PM_{10}$ and $PM_{2.5}$ - Linking Emissions Sources with Air Quality

The size, concentration, and chemical composition of PM vary by region and by season. A number of areas exhibit strong seasonal patterns. Other areas have a much more uniform distribution with PM concentrations remaining high throughout the year. In yet other areas, isolated PM exceedances can occur at any time of the year.

In the San Joaquin Valley, the San Francisco Bay Area, and the Sacramento region, there is a strong seasonal variation in PM, with higher $PM_{10}$ and $PM_{2.5}$ concentrations in the fall and winter months (refer to Figure 2-10). In the winter, $PM_{10}$ and $PM_{2.5}$ concentrations remain elevated for extended periods. These higher concentrations are caused by increased activity for some emission sources and meteorological conditions that are conducive to the build-up of PM. During the winter, the $PM_{2.5}$ size fraction drives the PM concentrations, and the major contributor to high levels of ambient $PM_{2.5}$ is the secondary formation of PM caused by the reaction of $NO_x$ and ammonium to form ammonium nitrate. The San Joaquin Valley also records high $PM_{10}$ levels during the fall. During this season, both the coarse fraction and the $PM_{2.5}$ fraction drove the PM concentrations.

In the South Coast region, $PM_{10}$ concentrations remain high throughout the year (refer to Figure 2-11). $PM_{2.5}$ concentrations can reach high levels in the spring, fall, and winter. The more uniform activity patterns of emission sources, as well as less variable weather patterns, leads to this more uniform concentration pattern. In other areas, high PM can be more episodic than seasonal. For example, in the Owens Lake area of the Great Basin Valleys Air Basin, episodic fugitive dust events lead to very high $PM_{10}$ levels, with soil dust as the major contributor to ambient $PM_{10}$.

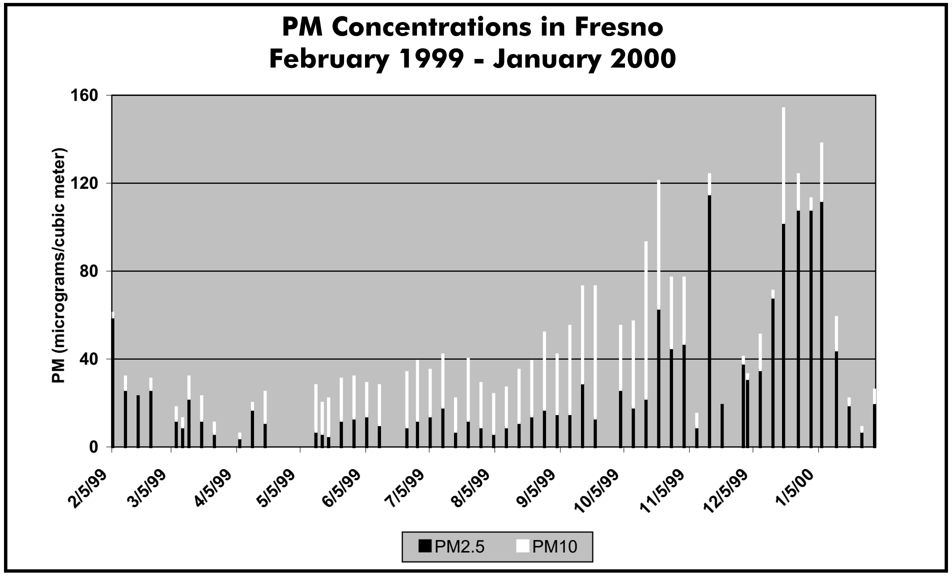


Figure 2-10

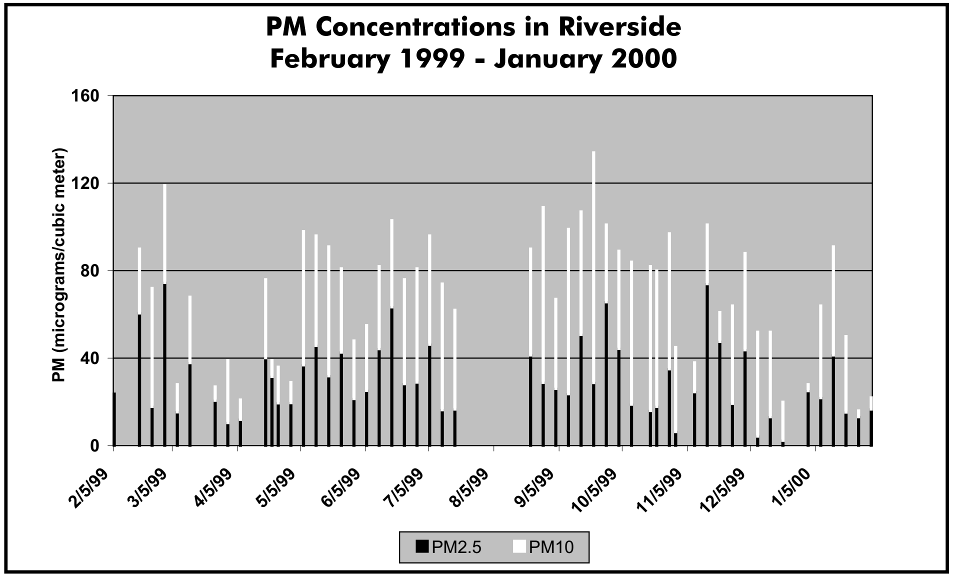


Figure 2-11

Analysis of PM chemical composition data collected from a variety of routine and special monitoring programs provides insight into the fraction of $PM_{2.5}$ that is secondary. Data were obtained from the California $PM_{2.5}$ and $PM_{10}$ monitoring networks, California Regional $PM_{10}$/$PM_{2.5}$ Air Quality Study, Children's Health Study, Integrated Monitoring and Protected Visual Environments Program, and South Coast Air Quality Management District's PM Technical Enhancement Programs of 1995 and 1998-1999. Secondary $PM_{2.5}$ estimates include ammonium nitrate and ammonium sulfate components, which form through reactions in the atmosphere of nitrogen oxides and sulfur oxides emitted by motor vehicles and other combustion processes. $PM_{2.5}$ also includes secondary organic aerosols (SOA) resulting from atmospheric reactions of organic compounds emitted from combustion sources and biogenic processes. Since only limited information is available on how much of the measured $PM_{2.5}$ organic carbon component is secondary, SOA are not included in the secondary $PM_{2.5}$ estimates. However, available studies suggest that in the South Coast, on an annual average basis, SOA may constitute 6 to 16 percent of $PM_{2.5}$ (Schauer et. al. 1996) and in urban areas of the San Joaquin Valley, during the winter, SOA may contribute up to an average of eight percent of $PM_{2.5}$ (Schauer and Cass, 1998).

Chemical Mass Balance (CMB) models are used to establish which sources and how much of their emissions contribute to ambient PM concentrations. CMB models use chemical composition data from ambient PM samples and from emission sources. These data are often collected during special source attribution studies. The source attribution data presented in this section were derived from a variety of studies with differing degrees of chemical speciation. In general, however, the source categories can be interpreted in the following manner. The road and other dust, wood smoke, cooking, vehicle exhaust, and construction categories represent sources which directly emit particles. Road and other dust represents the combination of mechanically disturbed soil (paved and unpaved roads, agricultural activities) and wind-blown dust. Wood smoke generally represents residential wood combustion, but may also include combustion from other biomass burning such as agricultural or prescribed burning. The vehicle exhaust category represents direct motor vehicle exhaust particles from both gasoline and diesel vehicles. Construction reflects construction and demolition activities. Ammonium nitrate and ammonium sulfate represent secondary species (i.e., they form in the atmosphere from the emissions of nitrogen oxides ($NO_x$), sulfur oxides ($SO_x$), and ammonia). Combustion sources such as motor vehicles and stationary sources contribute to the $NO_x$ that forms ammonium nitrate. Mobile sources such as diesel vehicles, locomotives, and ships and stationary combustion sources emit the $SO_x$ that forms ammonium sulfate. Ammonia sources include animal feedlots,

| Estimated Secondary Portion of $PM_{2.5}$ (annual average) | |
|---|---|
| Air Basin | Secondary $PM_{2.5}$ (%) |
| Great Basin Valleys | 30 |
| Lake County | 30 |
| Lake Tahoe | 40 |
| Mojave Desert | 40 |
| Mountain Counties | 10 |
| North Central Coast | 40 |
| North Coast | 30 |
| Northeast Plateau | 30 |
| Sacramento Valley | 30 |
| Salton Sea | 40 |
| San Diego | 50 |
| San Francisco Bay Area | 40 |
| San Joaquin Valley | 40 |
| South Central Coast | 50 |
| South Coast | 60 |

Table 2-16

fertilizers, and motor vehicles. The other carbon sources category reflects organic sources not included in the source attribution models, such as natural gas combustion, as well as secondary organic carbon formation. The unidentified category represents the mass that cannot be accounted for by the identified source categories. It can include particle-bound water, as well as other unidentified sources.

The figures on the following pages present the best available source attribution data from CMB modeling for selected regions. These presentations are representative of typical days when the State $PM_{10}$ standards are exceeded (refer to Chapter 1, for a review of the State standards). The fractions of the constituents shown can vary daily and from year to year, depending on factors such as meteorology.

## San Joaquin Valley Air Basin

Figures 2-12 and 2-13 illustrate contributions to ambient PM in the San Joaquin Valley during the winter and on an annual average basis. These are the results from analysis of data collected during the California Regional $PM_{10}/PM_{2.5}$ Air Quality Study. (San Joaquin Valley Air Pollution Control District, 2003)

During the winter in Fresno secondary ammonium nitrate was the largest contributor to $PM_{10}$, formed from NOx emissions from mobile and stationary combustion sources, combined with ammonium. Emissions from wood smoke, vehicle exhaust, and road and agricultural sources also contribute significantly to $PM_{10}$ levels. On an annual average basis, elevated concentrations of $PM_{10}$ were associated with high levels of road and agricultural dust. Secondary ammonium nitrate, wood smoke, and vehicle exhaust particles also contributed significantly to annual $PM_{10}$ concentrations.

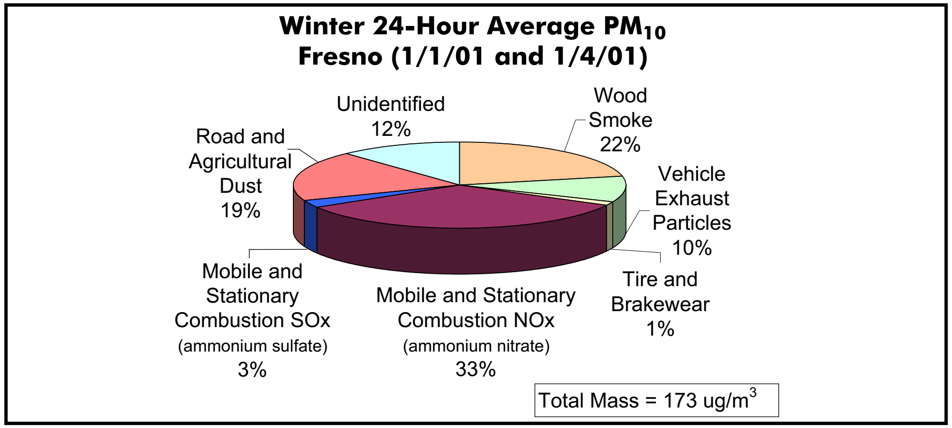


Figure 2-12

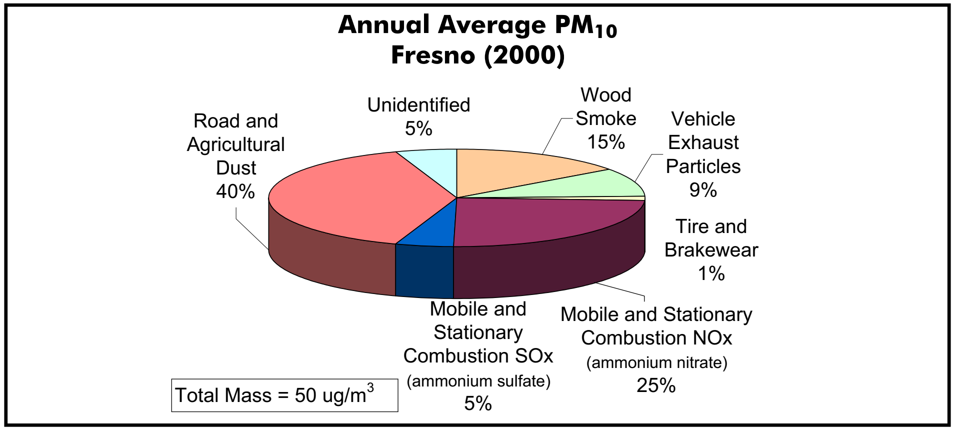


Figure 2-13

## San Francisco Bay Area Air Basin

Figures 2-14 and 2-15 illustrate the sources of PM during the winter in the San Francisco Bay Area. The data are from the source apportionment analysis conducted by the Bay Area Air Quality Management District using samples collected during two special studies (Fairley, 1996, 2001).

During the winter, in San Jose, high PM concentrations are associated with high levels of wood smoke, primarily from residential wood combustion, and cooking. $NO_x$ emitted from mobile and stationary combustion sources, in combination with ammonium, contributes about one-fourth of the PM levels in the form of ammonium nitrate. Particle emissions from mobile and stationary combustion sources are also a major contributor to $PM_{2.5}$. Road dust is a significant contributor to $PM_{10}$, but not $PM_{2.5}$.

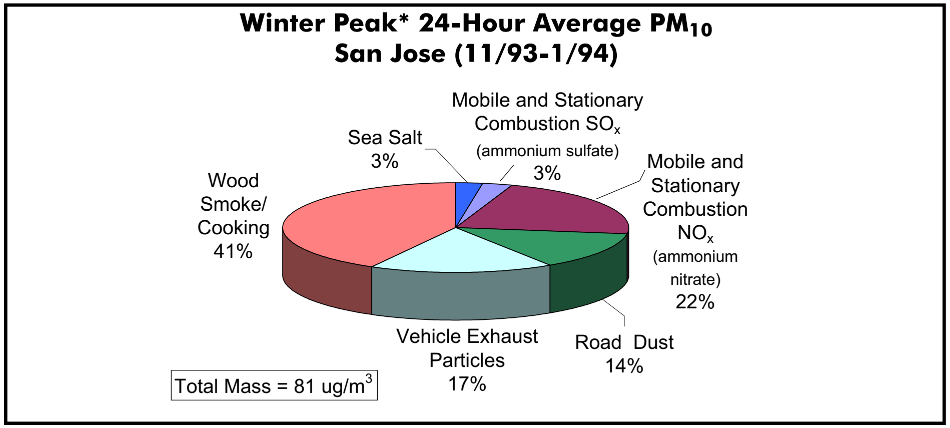


Figure 2-14

* Average of days with $PM_{10}$ > 50 ug/m3

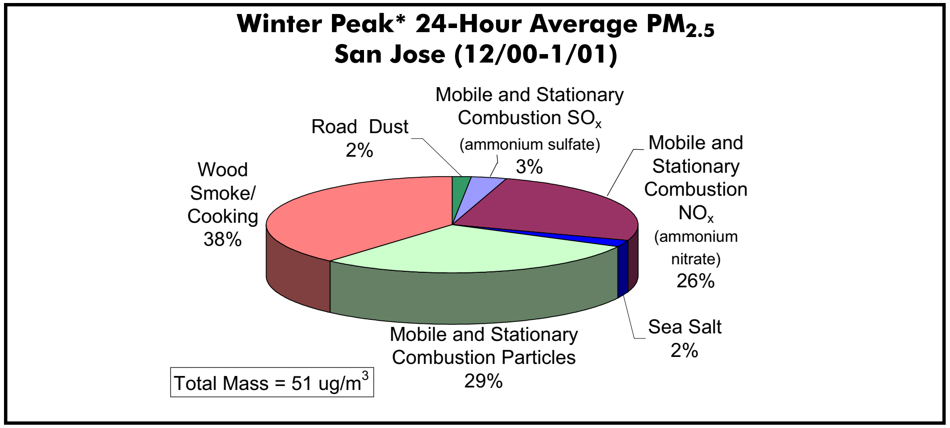


Figure 2-15

* Average of days with $PM_{2.5}$ > 40 ug/m3

## Sacramento Valley Air Basin

Figures 2-16 and 2-17 illustrate source contributions to ambient $PM_{10}$ and $PM_{2.5}$ during the winter in Sacramento. The data are from the analysis of ambient air samples collected from November through January, during the six year period of 1991 through 1996 (Motallebi, 1999).

$NO_x$ emissions from mobile and stationary combustion sources, combined with ammonium to form ammonium nitrate, is the largest contributor to ambient PM levels. Vehicle exhaust particle emissions and wood smoke from residential wood combustion also contribute significantly. While road and other dust is a significant component of ambient $PM_{10}$, its contribution to $PM_{2.5}$ is minor.

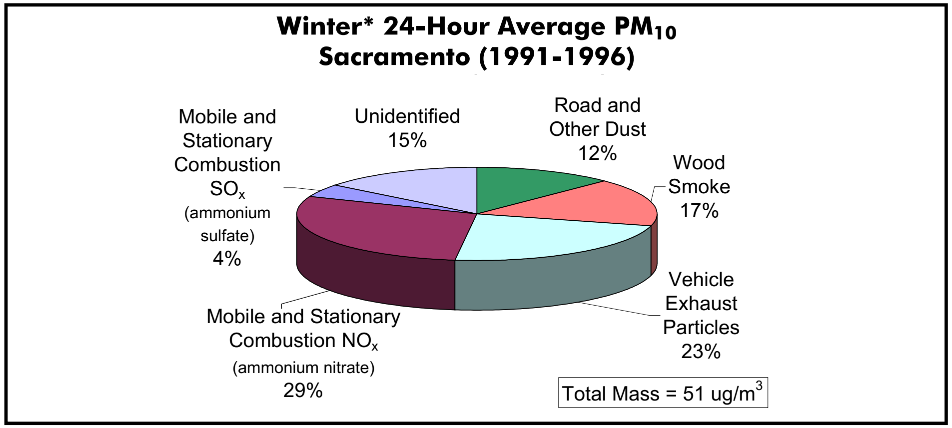


Figure 2-16

* Average of days with $PM_{10}$ > 40 ug/m3

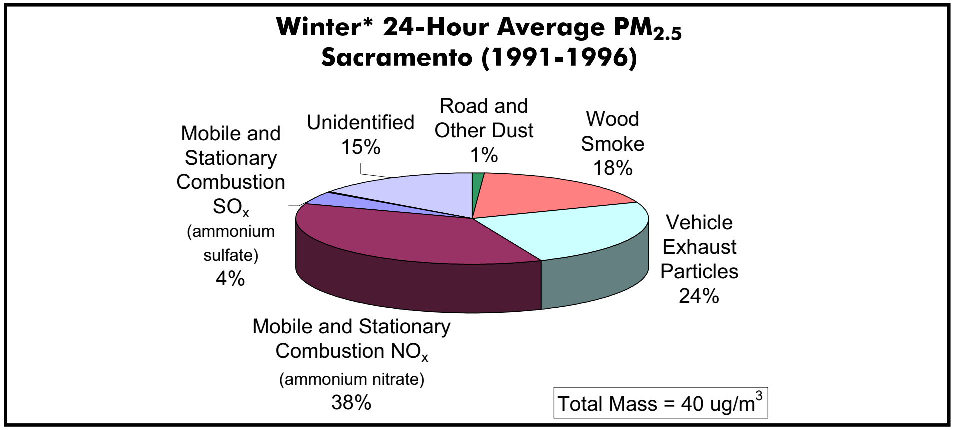


Figure 2-17

* Average of days with $PM_{10}$ > 40 ug/m3

### South Coast Air Basin

Data for Figures 2-18, 2-19, 2-20, and 2-21 are from the source apportionment analysis that the South Coast Air Quality Management District (SCAQMD) performed for the 1997 Air Quality Management Plan. SCAQMD collected samples during a one-year special study from January 1995 to February 1996, as part of the $PM_{10}$ Technical Enhancement Program (SCAQMD, 1996).

On an annual basis, in Central Los Angeles, dust from roads and construction is the major contributor to ambient $PM_{10}$. This is not the case for the episode on November 17, 1995. In both cases, $NO_x$ and $SO_x$ emitted from mobile and stationary combustion sources, combined with ammonium, contribute significantly in the form of ammonium nitrate and sulfate. Vehicle exhaust particles and emissions from other carbon sources also contribute to both annual and episodic ambient $PM_{10}$ levels.

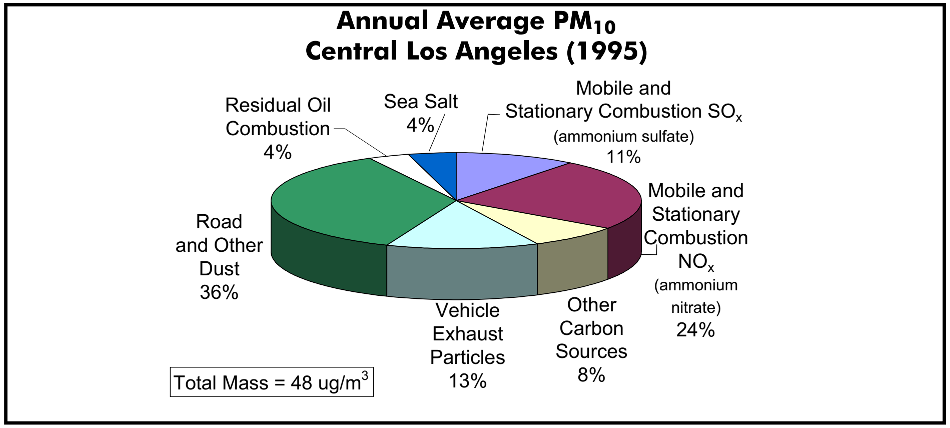


Figure 2-18

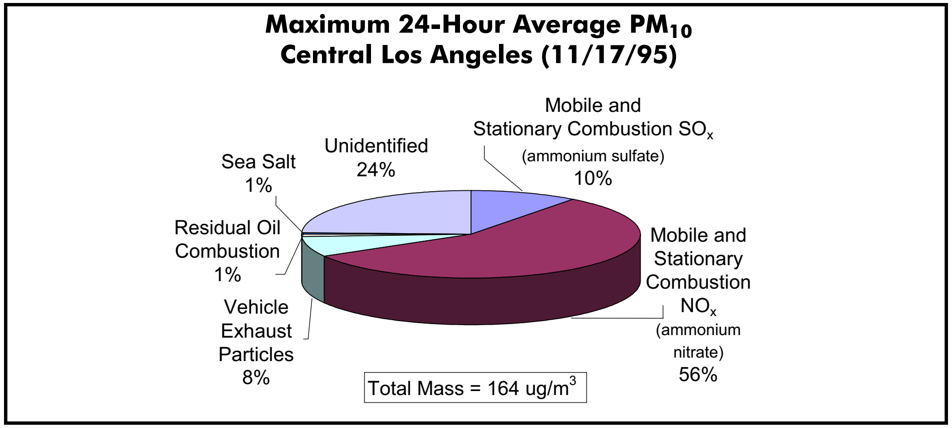


Figure 2-19

On an annual basis, in Rubidoux, dust from roads and construction is the major contributor to ambient $PM_{10}$. In contrast, dust was a minor contributor to the $PM_{10}$ episode on November 17, 1995. In both cases, ammonium nitrate formed from $NO_x$ emitted from mobile and stationary combustion sources, combined with ammonium, contributes significantly. Vehicle exhaust particles and emissions from other carbon sources also contribute to both annual and episodic ambient $PM_{10}$ levels.

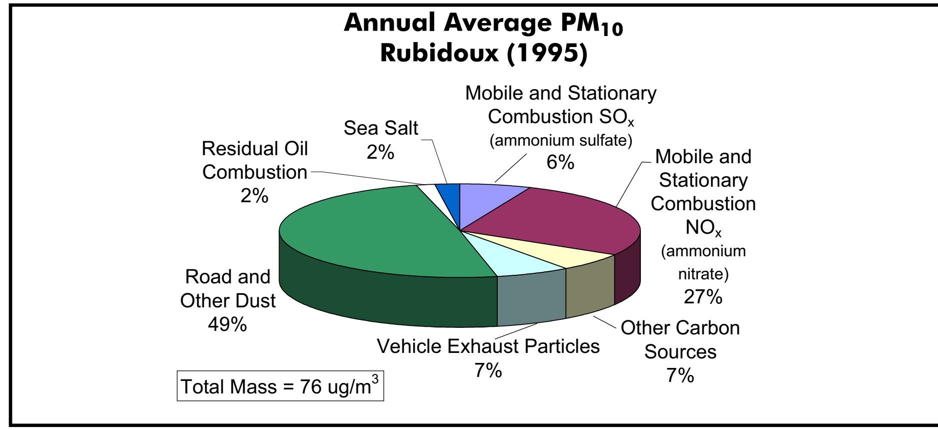


Figure 2-20

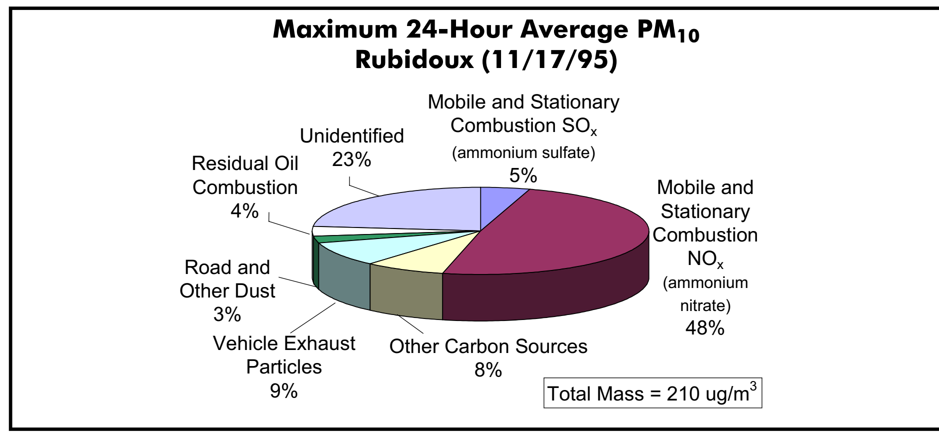


Figure 2-21

## References for Particulate Matter:

Fairley, D. *Source Apportionment of Bay Area Particulates.* 1996; Personal communication.

Fairley, D. *$PM_{2.5}$ Source Apportionment for San Jose 4th Street.* 2001; Personal communication.

Motallebi, N. *Wintertime $PM_{10}$ and $PM_{2.5}$ Source Apportionment at Sacramento, California.* Journal of the Air & Waste Management Association 1999; 49:PM-25-34.

South Coast Air Quality Management District. *"Modeling and Attainment Demonstrations"* in 1997 Air Quality Management Plan, Diamond Bar, California. 1996.

Schauer, J. J., Rogge, W. F., Hidemann, L. M., Mazurek, M. A., and Cass, G. R. *Source Apportionment of Airborne Particulate Matter Using Organic Compounds as Tracers.* Atmospheric Environment; 30: 22, 3837-3855, 1996.

San Joaquin Valley Air Pollution Control District. *2003 $PM_{10}$ Plan: San Joaquin Valley Plan to Attain Federal Standards for Particulate Matter 10 Microns and Smaller.* Appendix N.

# *Carbon Monoxide*

## 2004 Statewide Emission Inventory - Carbon Monoxide by Category

Carbon monoxide (CO) gas is formed as the result of incomplete combustion of fuels and waste materials such as gasoline, diesel fuel, wood, and agricultural debris. Mobile sources generate about 82 percent of the statewide CO emissions. Diesel-powered on-road and other mobile vehicles are small CO contributors. Stationary and area-wide sources of CO are the same types of fuel combustion sources that also generate $NO_x$. The stationary source contribution to statewide CO is small, due in part to widespread use of natural gas as a fuel and the presence of combustion controls.

| CO Emissions (annual average) | | |
|---|---|---|
| **Emissions Source** | **tons/day** | **Percent** |
| **Stationary Sources** | 405 | 3% |
| **Area-wide Sources** | 2138 | 15% |
| **On-Road Mobile** | 8172 | 59% |
| Gasoline Vehicles | 8033 | 58% |
| Diesel Vehicles | 139 | 1% |
| **Other Mobile** | 3087 | 22% |
| Gasoline Vehicles | 2463 | 18% |
| Diesel Vehicles | 275 | 2% |
| Other | 349 | 3% |
| ***Total Statewide*** | ***13802*** | ***100%*** |

Table 2-17

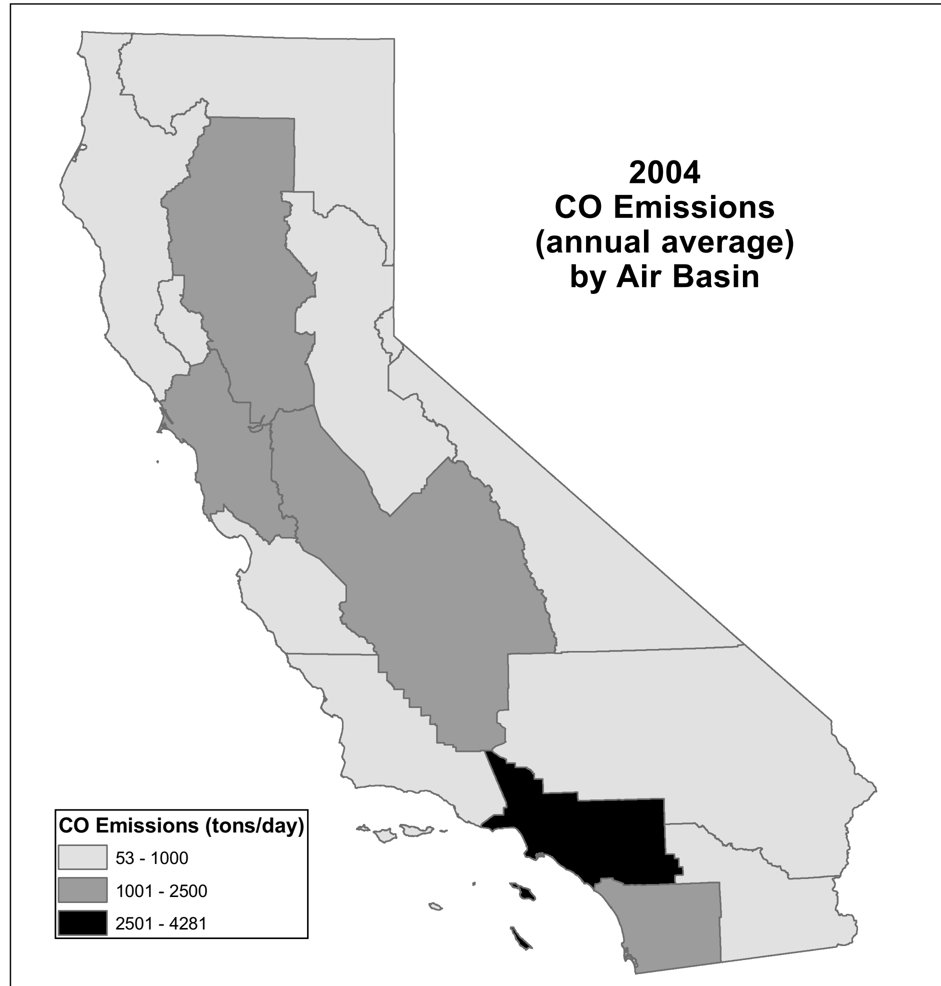


Figure 2-22

## Carbon Monoxide - 2003 Air Quality

The State and national carbon monoxide standards are now attained in most areas of California. The requirements for cleaner vehicles and fuels have been primarily responsible for the reductions in CO, despite significant increases in population and the number of vehicle miles traveled each day.

However, there is still one problem area: the City of Calexico in Imperial County. While CO concentrations continue to decrease throughout most of the State, the CO problem in Calexico is unique in that this area shares a border with Mexico. There is a high likelihood that cross-border traffic contributes to the local CO problem in this area, and more study is needed to determine the most effective control strategy. The Calexico area has made progress towards attainment. Peak levels have been declining as have the number of days that State and federal standards are exceeded. In 2003, Calexico did not have any exceedances of the State and federal CO standards.

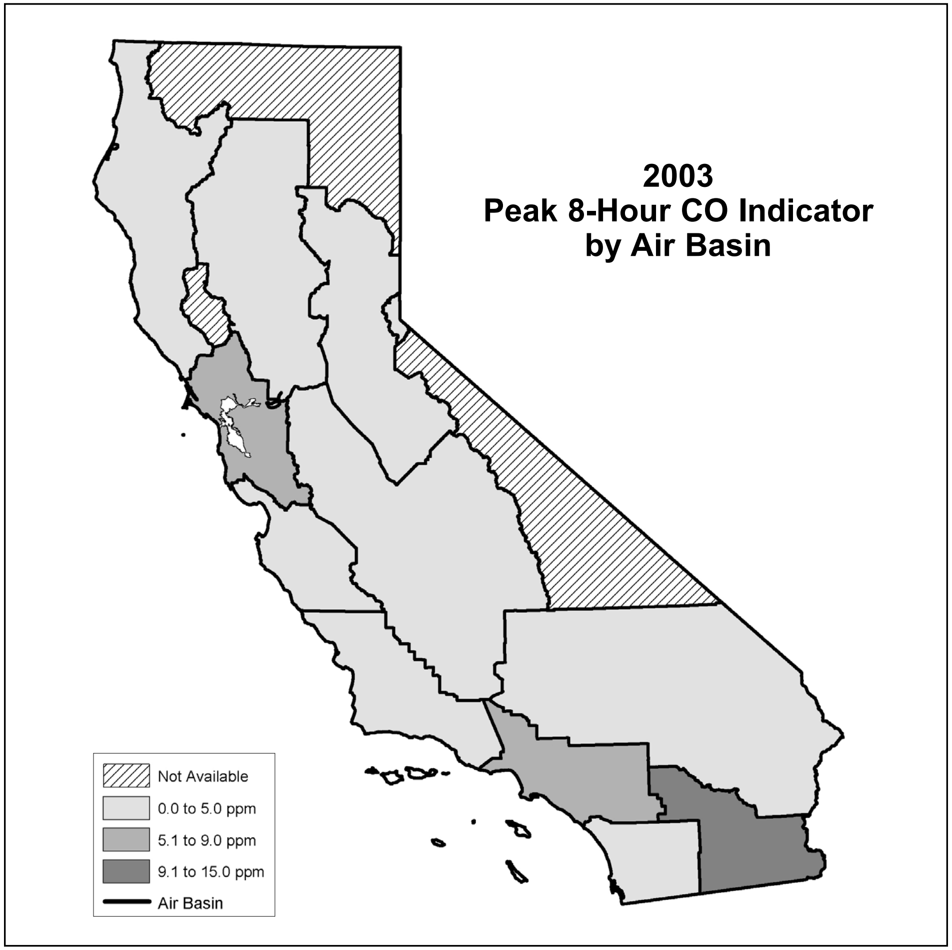


Figure 2-23

## Carbon Monoxide - 2003 Air Quality Tables

**Maximum Peak 8-Hour Indicator by Air Basin**

| AIR BASIN | 2003 Maximum Peak 8-Hour Indicator in parts per million | Number of Days in 2003 above 8-Hour Standard | |
|---|---|---|---|
| | | State | National |
| Great Basin Valleys Air Basin | Incomplete Data | Incomplete Data | Incomplete Data |
| Lake County Air Basin | Incomplete Data | Incomplete Data | Incomplete Data |
| Lake Tahoe Air Basin | 1.9 | 0 | 0 |
| Mojave Desert Air Basin | 2.0 | 0 | 0 |
| Mountain Counties Air Basin | 1.6 | 0 | 0 |
| North Central Coast Air Basin | 1.4 | 0 | 0 |
| North Coast Air Basin | 2.3 | 0 | 0 |
| Northeast Plateau Air Basin | Incomplete Data | Incomplete Data | Incomplete Data |
| Sacramento Valley Air Basin | 4.4 | 0 | 0 |
| Salton Sea Air Basin | 11.5 | 0 | 0 |
| San Diego Air Basin | 5.0 | 1 | 1 |
| San Francisco Bay Area Air Basin | 5.5 | 0 | 0 |
| San Joaquin Valley Air Basin | 4.8 | 0 | 0 |
| South Central Coast Air Basin | 2.7 | 0 | 0 |
| South Coast Air Basin | 8.7 | 0 | 0 |

Table 2-18

## Sites with Peak 8-Hour Indicator Values above the State CO Standard

### Salton Sea Air Basin

- Calexico-Ethel Street

Only one site had peak 8-hour indicator values above the level of the State CO standard during 2003. If an air basin is not listed, the peak indicator values at sites in that air basin were not above the State CO standards.

Table 2-19

# *Ammonia*

## 2004 Statewide Emission Inventory - Ammonia by Category

Area-wide sources account for 69 percent of the statewide emissions of ammonia. The major area-wide source of ammonia is livestock waste. Ammonia emissions from on-road vehicles are produced by three-way catalyst equipped gasoline vehicles. Ammonia emissions from stationary sources are primarily related to $NO_x$ emission controls and the manufacture of a variety of products.

Ammonia emission sources have strong geographic differences. In the San Joaquin Valley, ammonia emissions are dominated by livestock and other agricultural sources. However, in the South Coast Air Basin, motor vehicle sources are more significant.

| $NH_3$ Emissions (annual average) | | |
|---|---|---|
| **Emissions Source** | **tons/day** | **Percent** |
| **Stationary Sources** | 49 | 10% |
| **Area-wide Sources** | 341 | 69% |
| **On-Road Mobile** | 103 | 21% |
| Gasoline Vehicles | 103 | 21% |
| Diesel Vehicles | 0 | 0% |
| **Other Mobile** | 0 | 0% |
| Gasoline Vehicles | 0 | 0% |
| Diesel Vehicles | 0 | 0% |
| Other | 0 | 0% |
| ***Total Statewide*** | ***493*** | ***100%*** |

Table 2-20

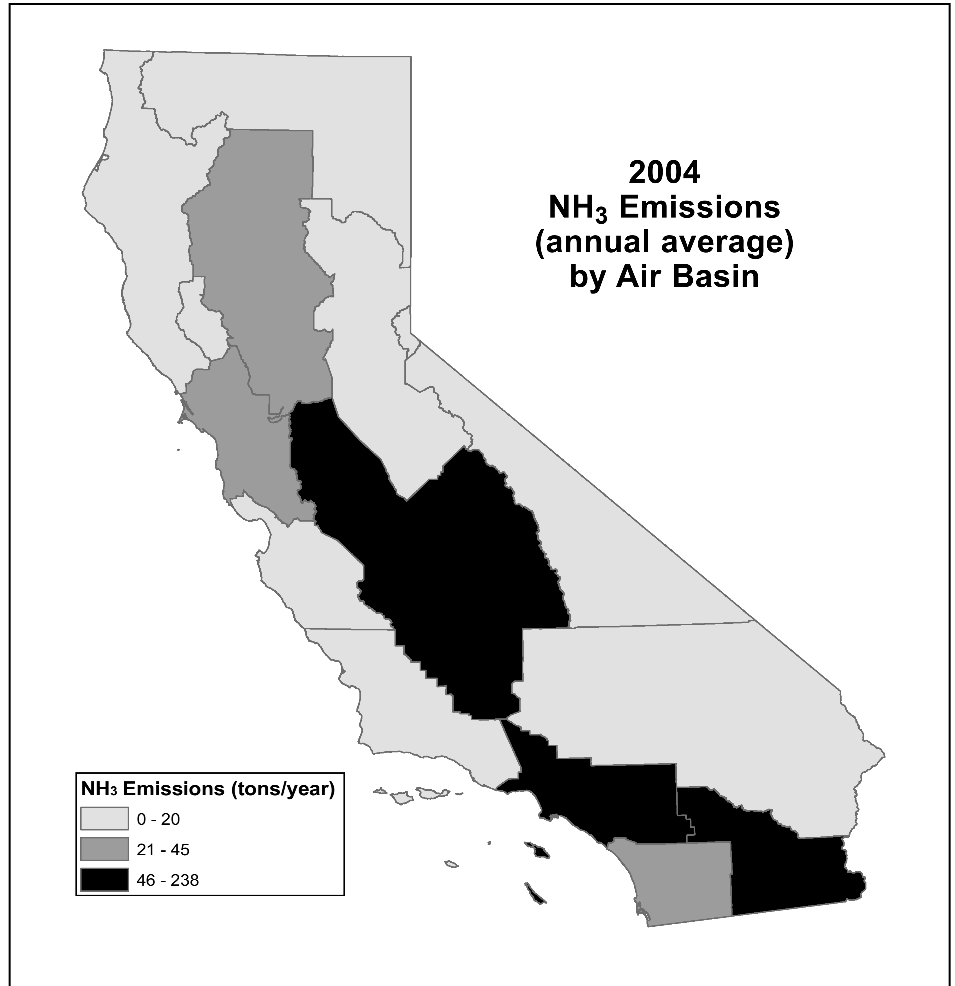


Figure 2-24

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